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Investigating the Rationale of Registered Dietitians in Selection of Predictive Equations for Estimation of Resting Metabolic Rate

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A research paper in fulfillment of the requirements

for the MS Nutrition and Dietetics Program

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Abstract

Background: Resting metabolic rate (RMR) is a critical component of appropriate nutrition plans for Registered Dietitians (RDs) in clinical and outpatient care. Many RMR equations can address some variances. The “clinical judgement” is recommended by the Academy of Nutrition and Dietetics (AND) to decide the best RMR equation. With the discernment of the RD in mind, it was pertinent to delve into the thought-process behind why dietitians used specific energy formulas over other choices.

Objective: To determine which RMR formulas were chosen when calculating caloric needs for patients and assess any trends in rationale for RDs when selecting specific predictive energy formulas.

Design: A descriptive study was conducted through an anonymous online survey through Qualtrics Survey Software. The survey link was included in the emails obtained from Commission on Dietetic Registration (CDR) and sent out to 3,000 current RDs in the United States.

Participants: 165 RDs (≥ 21 y/o) with active RD credential and currently calculating energy needs in their facilities participated the research.

Main outcome measures: Demographic information, the bias of equations, years of trusted clinical judgment, the use of indirect calorimetry, accuracy of equations and patient outcome, the relationship between demographics and choices of equations.

Statistical analyses performed: Mean and standard deviation and frequency (percentage) were computed for demographics. The Fisher’s Exact Test determined the relationships between the outcome variables and demographic variables.

Results: 66% of RDs use the Kcal per kg body weight equation most frequently for energy needs estimation of the patients. 80% of participants were aware of the biases present in RMR equations. RDs choice of equation is influenced by age ($p=0.024$) and number of years certified ($p=0.004$).

Conclusions: These findings support rationale for future research on improving RMR formula accuracy to reduce caloric imbalances and avoid any resulting unintended weight gain or weight loss in patients.

Introduction

Resting metabolic rate (RMR), also referred to as resting energy expenditure (REE), is the total energy, or Calories, used by the body in a resting state. The measurement comprises a 50-75% majority of the total energy expenditure (TEE) formula, which includes the RMR along with daily energy for routine activity, digestion, and exercise.¹ As the largest part of an individual's daily Calories, RMR is a critical component for Registered Dietitians (RDs) in assessment of nutrition needs and determination of appropriate interventions in clinical and outpatient care. Often used interchangeably with basal metabolic rate (BMR), the resting state for measuring RMR involves a postabsorptive, thermoneutral participant supine or reclined whereas BMR measurement typically occurs in the morning after an overnight fast with no physical activity for a 24-hour period.² Regarding calculation for daily energy needs, a preference for RMR utilization over BMR exists due to the less restrictive nature of its measurement, which more accurately mimics the fed-fast states and physical activity of individuals throughout the day.³

Direct and indirect calorimetry methods both produce accurate RMR measurements when adjusting for individual health and body characteristics.⁴ As early as the end of 19th century, respiratory chambers were used for direct calorimetry by calculating the specific amount of heat released from the body.⁴ Invented shortly after, indirect calorimetry also measures body heat through the relationship between gas volumes of oxygen consumption and carbon dioxide production reflecting cellular respiration. Indirect calorimetry is considered the gold standard for RMR, as the results usually maintain 5% variation when all parameters are stable.⁵ Often reserved for research purposes only, calorimetry lacks clinical application due to high expense costs, long durations for accurate measurement, and extensive training for personnel.⁴ In

response, mathematical equations were developed with calorimetry measures in mind as the modern method for determination of caloric needs. These RMR equations assess daily energy requirements for patients in most clinical and outpatient settings such as hospitals, skilled nursing facilities, and even fitness clubs. Many of the formulas achieved validation status based on study populations of healthy, normal Body Mass Index (BMI) participants with various genders, ages, and ethnicities.⁴ As a result, a substantial range of error exists in application of a previously tailored formula to a patient with different characteristics than its original subject demographics.

Most of the discrepancy in RMR calculations stem from differences in body composition. Obese individuals have a higher percentage of adipose tissue than those who are lean. Since fat tissue has a lower metabolic rate per unit compared to lean fat-free tissue, this causes results to be skewed when using actual weight in some RMR formulas. In 2005, the Journal of American Dietetic Association (JAND) published a systematic review of RMR comparison between healthy obese and non-obese individuals to conclude the Mifflin-St. Jeor, known by most nutrition professionals, resulted in 72% accuracy in obese subjects compared to 82% accuracy in non-obese individuals.^{1,4} However, a 2012 publication from Brazil found the Harris-Benedict equation more accurate in obese individuals, accounting for a wider age range when compared to indirect calorimetry measurements.⁶

Age-related changes in body composition also increase error in RMR calculation. Natural aging progressively raises body fat percentages and lowers lean muscle mass, further influencing energy expenditure. The range of 50 to 84 years comprises the bulk older age group evaluated for RMR validation studies, omitting the over 85-year-old patients from consideration.⁴ A 2013 clinical nutrition article explored the accuracy of mathematical RMR calculations to indirect

calorimetry in older adults and found the Mifflin-St. Jeor equation possessed the largest bias for an average 12% underestimation for energy needs in the elderly subjects.⁷ Nearly all common RMR formulas showed high variability for older adults. Therefore, the study concluded an advanced statistical technique called Aggregate modeling, not typically used in medical settings, resulted in the highest accuracy.⁷ Further, ethnic group differences also contribute to variance in energy balance formulas; however, no validation studies exist to further explore the discrepancies.⁴

After reviewing 22 papers, the Academy of Nutrition and Dietetics Evidence Analysis Library, notably last updated in 2010, concluded the best equations to estimate RMR in non-obese critically ill patients, in order: Penn State University (PSU 2003b), Brandi, Mifflin-St. Jeor, and Faisy.² For obese patients, the PSU 2010 predicted energy expenditure with 74% accuracy, the highest result.² In the 2005 JAND systematic review, the panel recommended the Mifflin-St. Jeor equation for the best general RMR estimation, despite its shortfalls in age-related bias.⁴ Considering health status and individual characteristics, the verdicts from previous research on “best” recommendations for RMR equations are based on expert opinion and can address one variance, such as obesity, age, or gender, but cannot account for all demographics.

Accuracy in RMR measurement proves vital for patients and their paths to recovery or health promotion in a variety of healthcare settings. Caloric imbalances stemming from errors in energy expenditure calculation can hinder progress toward achievement of crucial nutrition intervention goals and can further result in unintentional weight loss or gain. Every few years new RMR equations arise in hopes of addressing individual discrepancies, making the selection of specific formulas more difficult in application to different contexts. The closing recommendation the JAND expert panel made for Registered Dietitians resided in the

practitioner using “clinical judgement” to decide the best equation to determine RMR.⁴ With the discernment of the RD in mind, it was pertinent to delve into the thought-process and justification behind why dietitians used specific energy formulas over other choices. Additionally, assessing the interest in possible establishment of universal guidelines to streamline RMR equations in differing situations can open dialogue for subsequent steps to address the opinion-based determinations of energy expenditure prevalent today. Therefore, the purpose of this graduate research study was to determine which formulas were chosen when calculating caloric needs, assess trends in reasoning and motivation of RDs when selecting RMR formulas, and gauge potential interest in future guidelines to aid this process through an anonymous survey.

Subjects

Participants were sought from the approximately 3,000 male and female current Registered Dietitians in the United States. The age range was 21 years and above. Email contact information was obtained from the Commission on Dietetic Registration to recruit respondents and collect data. The dietitians who received the emails voluntarily responded to the anonymous survey.

Inclusion criteria:

- Active Registered Dietitian credential in the United States
- RDs currently calculating energy needs in facilities such as hospitals, diabetic clinics, dialysis centers, skilled nursing facilities (SNF)/ Extended Care Facility, senior centers, fitness centers, etc.

Exclusion criteria:

- Retired Registered Dietitians
- Certified Nutrition Specialists

The information letter emails explained the purpose and design of the research. All methods and procedures were approved by the Institutional Review Board of Loma Linda University prior to the beginning of the study.

Methods

An anonymous online survey was utilized to collect both quantitative and qualitative data for further analysis. *Qualtrics Survey Software* was the program used for creating the survey. Graduate students developed the study by designing and arranging the questions in the survey. The survey contained 19 questions, which included demographic information. The length of time to complete the survey was estimated to be less than 5 minutes depending on the respondents' desire to reply to free response sections. The survey aimed to understand the reasons for choosing specific equations to calculate RMR and a potential need for universal guidelines. Therefore, the questions mainly inquired the equations they usually use weekly, familiarity of various energy equations, free response about the reasons why using energy equations and recommendations. The examples of survey questions: *Which of the following RMR equations do you recognize? Would you be interested in further standardization regarding use of RMR equations?* The demographic information included age, gender, ethnicity, education level, current practice, past experience, location, income and employment status. For instance, *What is the highest educational degree you have completed? What facility do you currently work in?* Data were analyzed using the responses received. The survey questions were reviewed by up to three RDNs. A copy of the survey is attached in the appendix A.

Procedure

All the participants obtained an information letter email with the survey link from *Qualtrics Survey Software*. The basic information and purpose of the study was included in the information letter email. They read through the email first to understand the main goal of the research. Then, participants decided whether to accept or decline the invitation of participating the study. If they were willing to join the research study, they clicked the link, completed the survey and submitted the results. By clicking the link, they gave consent to participate in the study. Then, data was categorized according to their answers. The statistical analysis was conducted with the information from participants' responses.

Statistical Analysis

Mean and standard deviation was computed for continuous variables while frequency (percentage) was computed for qualitative variables. The Fisher's Exact Test, an alternative to Chi-Square Test of Independence when one or more of the cell counts in a 2x2 table is less than 5, was used determine if there is a significant relationship between the outcome variable and demographic variables. Further analysis used Comparison of Column Proportions to determine the significant difference between each demographic category with different RMR equations. One way ANOVA was used to look at the age among different RMR equations. Data were analyzed using SPSS Statistics Software version 27.0 (SPSS Inc, Chicago, IL, USA). All analyses were performed at an alpha level of .05.

Results

A total of 182 responses of the survey were received out of 3,000 emails sent out to Registered Dietitians in the United States. Among the responses, 17 respondents were excluded

due to incomplete questionnaires resulting in 165. The demographic information of 165 participants is shown in Table 1. Of 165 participants included in the analysis, the average age was 38.6 (\pm 12.2) years. Most participants had Master's degree (59.4%), obtained RD Certification 3-10 years ago (40%), and mainly worked in hospitals (50.9%).

Table 1. Mean (SD) and Frequencies (%) of Demographic Characteristics

	Mean (SD)
Age (years)	38.6 (12.2)
	Frequency (%)
Highest Degree	
Bachelor	63 (38.2)
Masters	98 (59.4)
Doctorate	4 (2.4)
RD Years of Experience	
0-2	32 (19.4)
3-10	66 (40.0)
11-20	31 (18.8)
21+	36 (21.8)
Workplace Type	
Hospital	84 (50.9)
SNF	29 (17.6)
Outpatient Center	18 (10.9)
Private Practice	14 (8.5)
Dialysis Center	14 (8.5)
Diabetes Clinic	1 (0.6)
University	1 (0.6)
Other	1 (0.6)

RD: Registered Dietitian, SD: Standard Deviation

Among 12 evidence-based predicative RMR equations listed in the survey, RDs' choices for RMR equations under different circumstances are presented in Table 2. More than 90% of participants recognized two and greater equations. However, 61.2% participants have only used two to three RMR equations. The majority of equations that RDs recognized and used are kcal per kg body weight, Mifflin-St. Jeor and Harris-Benedict. Kcal per kg body weight is the most frequently used equations for most dietitians (66.1%) participating the survey. Likewise, the outcomes presented that Kcal per kg body weight is the main equations for calculating energy needs for obese (62.4%) and older or older than 65+ (61.8%) patients. To estimate the best energy needs for obese patients, adjusted body weight (38.8%) and actual body weight (35.8%) are most commonly used in the equations.

Table 2. Frequency (%) of Resting Metabolic Rate Survey Responses

	Frequency (%)
# of RMR Equations Known	
1	14 (8.5)
2-3	45 (27.3)
4-5	52 (31.5)
6+	54 (32.7)
# of RMR Equations Used	
1	46 (27.9)
2-3	101 (61.2)
4-5	16 (9.7)
6+	1 (0.6)
Go-to RMR Equation	
Kcal per kg body weight	109 (66.1)
Mifflin-St. Jeor	47 (28.5)
Harris-Benedict	8 (4.8)

WHO/FAO	1 (0.6)
Equation for Obese Pts	
Kcal/kg body weight	103 (62.4)
Mifflin St. Jeor	53 (32.2)
Harris-Benedict	7 (4.2)
WHO/FAO	1 (0.6)
Penn State	1 (0.6)
Equation for 65+ Older	
Kcal/kg body weight	102 (61.8)
Mifflin-St. Jeor	48 (29.1)
Harris-Benedict	9 (5.5)
Ireton-Jones	3 (1.8)
Penn State	3 (1.8)
Weight Used for Obese Pts	
Adjusted BW	64 (38.8)
Actual Weight	59 (35.8)
Hamwi Ideal BW	27 (16.4)
Other (qualitative)	15 (9.1)

RMR: Resting Metabolic Rate, Pts: Patients, BW: Body Weight

The result of the survey showed that most registered dietitians learned predicative equations while in school (30.3%) and from their co-workers (29.7%). In order to understand RDs' opinions about Evidence Analysis Library (EAL) from Academy of Nutrition and Dietetics (AND), clinical judgement, indirect calorimetry, standardized equations and bias of predicative equations, we collected responses from the survey and showed in Table 3. The familiarity of EAL levels was determined with the question, **“You prefer to use information from the AND Evidence Analysis Library that is rated.”** Grade I represents the strongest and most reliable

evidence, which is recognized by 35.8% participants, but still there are 30.3% participants not familiar with EAL levels. Three to five years of practice as RD (49.7%) had been supported to be the length of experience to build up trusted clinical judgements. More than half of participants (61.8%) supported that indirect calorimetry is impractical to use in healthcare setting. Most participants noticed inaccuracies of predicative RMR equations and did not believe RMR equations can be unbiased. Participants stated that “Inherent inaccuracies exist in all predictive equations, that's why an RD "estimates" energy/pro/hydration needs, then monitors outcomes until patient is stable. Clinical judgement/education is important for determination of appropriate methods for prediction.” “There is too much variation between patients of different ages, body sizes, and different clinical conditions.” The accuracy of RMR estimations was believed to improve patient outcomes by 78.8% of participants, and more than 80% of respondents are interested in further standardized of RMR equations. Other RDs, however, stated “we needed to see how patients are doing, which is not always what the numbers tell you should happen.”

Table 3. Frequency (%) of Registered Dietitian Survey Responses

	Frequency (%)
Acquisition of RMR Equation	
While in School	50 (30.3)
From Co-worker	49 (29.7)
Continuing Education	30 (18.2)
Self-Study	21 (12.7)
Other (qualitative)	15 (9.1)
Indirect Calorimetry Practical	
Yes	102 (61.8)
No	59 (35.8)
AND EAL Levels	

Grade I	59 (35.8)
Grade II	6 (3.6)
Grade III	10 (6.1)
Expert Opinion	31 (18.8)
Not familiar	50 (30.3)
Years of Trusted Clinical Judgement	
1-3	46 (27.9)
3-5	82 (49.7)
5-8	25 (15.2)
8-10	12 (7.3)
Notice of Bias	
Yes	132 (80)
No	33 (20)
Interest for Standardized Guidelines	
Yes	140 (84.8)
No	25 (15.2)
Can RMR be unbiased	
Yes	22 (13.3)
No	142 (86.1)
Can RMR accuracy improve Pt outcome	
Yes	130 (78.8)
No	34 (20.6)

RMR: Resting Metabolic Rate, AND EAL: Evidence Analysis Library from Academy of Nutrition and Dietetics, Pt: Patient

The relationship between choosing certain equations under certain circumstances and demographics was compared from responses from Q7-Q9 on questionnaire (Appendix A). The most frequently used predicative RMR equations and age categories had a statistically significant

association ($p=0.024$, Table 2). In order to determine which age group was responsible for the significance, we conducted further tests. The outcome found that RDs who are 45 years old or older are more likely to use Harris Benedict equations compared to RD's in other age categories ($p=0.012$, Table 4, Fig 1). However, it was not statistically significant between preferred RMR equation and education ($p=0.554$, Table 4), practice setting ($p=0.153$, Table 4) and RD certification date ($p=0.069$, Table 4); that is, RD's choice of equation was not influenced by their education level, where they practice and when they received their RD certification. Phi and Cramer's V are both tests of the strength of association. We can see that the strength of association between highest degree ($p= 0.59$, Table 4), facility types ($p= 0.16$, Table 4) and RD certification dates is very weak ($p= 0.064$, Table 4).

Table 4. Significance of RD preferred RMR equation to Demographics

		p-value
Preferred equation	Highest Degree	0.554
	Facility Type	0.153
	Number of Years Certified	0.069
	Age categories	0.024
	HB to > 45 years of age	0.012

RD: Registered Dietitian, HB: Harris Benedict

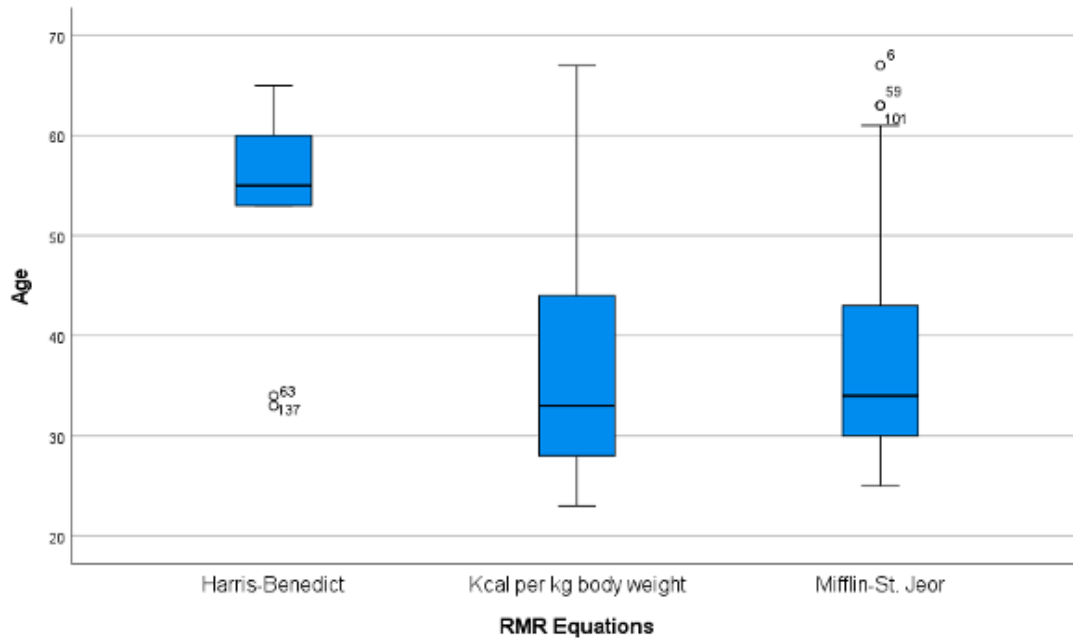


Fig 1. Comparison between Age and Preferred RMR equations

For patients aged 65 years old or over, a significant association had found between the type of equation used and age categories ($p=0.009$, Table 5) and RD certification date ($p=0.004$, Table 5). Further analysis determined which age and RD certification date groups were significant. When it comes to patient 65 years old or older, a larger proportion of RDs who are 45 years old and older utilize the Harris Benedict equation compared to other age categories ($p=0.003$, Table 3). RDs who received RD certification over 21 years ago showed to use the Harris Benedict equation as opposed to kcal per kg or Mifflin St. Jeor equations ($p=0.004$, $p=0.003$, Table 5). Nevertheless, there is no statistically significant association between demographics, including education level ($p=0.78$), age ($p=0.165$), RD certification date ($p=0.174$) and facility type ($p=0.205$), and preferred equations. The highest degree ($p=0.216$), age ($p=0.272$), RD certification date ($p=0.491$) and working places ($p=0.24$) neither

significant related to the preferred weight for calculation of obese patients' estimated energy needs.

Table 5. Significance of RD preferred RMR equation used for patients aged 65+ to Demographics

	p-value
Preferred equation	0.004
Number of Years Certified	0.004
21+ years: HB vs Kcal/kg	0.004
21+ years: HB vs. MSJ	0.002
Age category	0.009
>45 years to HB	0.003

RD: Registered Dietitian, HB: Harris Benedict, MSJ: Mifflin St Jeor

Discussion

Due to the inability of a single RMR equation accurately predicting calorie needs for all patient types, the study sought to gauge the reasoning behind why Registered Dietitians select the predictive equations they use. Kcal per kilogram of body weight predominated in popularity for preferred equation despite differences in patient characteristics. The high prevalence of the kcal/kg formula may relate to its ease of use, quick adaptability, and commonplace knowledge. Further, 51% of RD participants worked in a clinical setting, where the kcal/kg equation tends to be favorable in hospital environments (Table 1). This is partially due to the formula's adaptability to patient types, as 25 kcal/kg often correlates to healthy, normal BMI patients then the value of kcals can change from that set point depending on chronic disease state, patient age, weight, and other defining characteristics. Most clinical settings draft a rough guideline of the ranges for kcal/kg dependent on patient status to use as reference.

Regarding the 2005 JAND systematic review recommendation on using the Mifflin-St. Jeor (MSJ) formula as the best overall RMR equation, our survey results found the MSJ equation was the second most popular, with approximately a third of participants favoring its use (Table

2). It is important to note the systematic review did not include the kcal/kg formula at the time. Additionally, use of the AND Evidence Analysis Library did not factor into dietitians' decision-making process for RMR estimation, as 30% of participants were not familiar with the resource—these results may stem from its last update occurring over a decade ago and lack of advertisement on AND's website (Table 3).

Referencing back to the “clinical judgement” recommendation JAND's 2005 expert panel review made for RMR formula selection, the survey findings suggest dietitians do not agree on how many years equate to trusted judgement. The majority of responses, 50%, did deem three to five years of dietetic experience as adequate; however, more concrete standards should be made to provide consistent patient care regardless of the RD's experience level (Table 3). Due to the high diversity of practitioners in the dietetics field and with changing core practices over the years, RD clinical judgement determining energy estimation remains too open to interpretation and yields variable caloric needs for the same patient types. More practitioner demographics influenced RMR selection as the study found dietitians 45 years and older or certified for more than 21 years ago significantly preferred use of the Harris-Benedict equation over kcal/kg and MSJ in calculation for energy needs in patients 65 years and older (Table 5). These results can potentially correlate to the Harris-Benedict equation as the oldest predictive formula still used in clinical settings despite its 10% to 15% overestimation in caloric needs^{4,10}. Moreover, age of the RD significantly influenced personal go-to RMR equation use instead of highest degree, workplace, or certification date, which suggests older dietitians may select different formulas than their younger counterparts (Table 4). Due to 30% of survey respondents learning RMR equations while in school and only 18% from continuing education, older RDs may prefer utilizing familiar equations over learning new methods and formulas of caloric estimation (Table

3). Further, caloric needs estimation in dietetic programs currently includes the kcal/kg formula in order to mimic real-world scenarios for students destined for clinical rotations, as this equation was not taught in schools 20 years ago. The combination of the kcal/kg formula's familiarity with younger dietitians and the hesitance to stray from long-standing knowledge in dietitians 45 years and older may contribute to these findings.

Registered dietitians resoundingly answered yes when asked if more accurate RMR estimation might improve patient outcomes, which opens an opportunity to present solutions and improve predictive energy methods (Table 3). An entirely unbiased RMR equation seems doubtful from our results, as 86% of dietitians did not find this feasible; however, a sizeable 85% of respondents did express interest in standardization of formula selection (Table 3). Since the researchers found that practitioner demographics lead to inconsistent selection of RMR equations, thus affecting patient care, universal guidelines to determine specific predictive equations for various patient populations need to be made by a credible agency.

Limitations

The survey had a low response rate of 6% with 165 participants responding out of 3,000 emails sent. As a result, the study would have benefited from a larger sample size. Further, the only RMR equations included in the survey were gathered from the Evidence Analysis Library from AND. The library has not been updated since 2010, and with the emergence of new predictive equations over the years, the opportunity to include more modern and potentially accurate RMR formulas for consideration was missed. In addition, the free response portions of the survey did not undergo coding for qualitative analysis. Therefore, personalized thought processes of RDs when choosing RMR equations and beliefs on the practicality of standardized guidelines or indirect calorimetry in patient care settings was not further investigated.

Conclusion

In summary, Registered Dietitians overwhelmingly use the RMR equation "kcal per kg of body weight" to estimate caloric needs for varying patient demographics of age and body mass index. Despite most RDs acknowledging the bias present in energy equations, many participants did not believe RMR formulas can become bias free. However, most RDs did express interest in standardization guidelines for selection of RMR formulas and believe more accurate energy needs formulas can improve patient outcomes. These findings support rationale for future research on improving RMR formula accuracy to reduce caloric imbalances and avoid any resulting unintended weight gain or weight loss in patients. More studies focusing on the effect of accurate RMR estimation methods, such as indirect calorimetry, versus predictive formulas on patient outcome can determine the practicality of a more technical, accurate method in real world settings. With the existence of many RMR equations, an opportunity arises in the dietetics profession to streamline the selection process of predictive equations for a more consistent approach to patient care, regardless of practitioner demographics.

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Appendix A
Resting Metabolic Rate Questionnaire

- 1. What is your age?** Type in answer.

- 2. What is the highest educational degree you have completed?**
 - a. Bachelor's Degree
 - b. Master's Degree
 - c. Doctorate
 - d. Other, please specify:

- 3. How recently did you obtain your RD certification?**
 - a. 0-2 years ago
 - b. 3-10 years ago
 - c. 11-20 years ago
 - d. 21+ years ago

- 4. In what type of facility do you currently work?**
 - a. Hospital
 - b. Private Practice
 - c. Outpatient Counseling Center
 - d. Dialysis Center
 - e. Skilled Nursing Facility/Extended Care Facility
 - f. Diabetes Clinic
 - g. Senior Center
 - h. Fitness/Wellness Center
 - i. Other, please specify:

- 5. Which of the following RMR equations do you recognize?** Check all that apply.
 - a. Kcal per kg body weight
 - b. Harris-Benedict
 - c. Mifflin-St. Jeor
 - d. WHO/FAO
 - e. Brandi
 - f. Roth

- g. Faisy
- h. Fick
- i. Ireton-Jones
- j. Penn State
- k. Swinamer
- l. Owen
- m. Cunningham

6. Which of the following RMR equations do you use? Check all that apply.

- a. Kcal per kg body weight
- b. Harris-Benedict
- c. Mifflin-St. Jeor
- d. WHO/FAO
- e. Brandi
- f. Roth
- g. Faisy
- h. Fick
- i. Ireton-Jones
- j. Penn State
- k. Swinamer
- l. Owen
- m. Cunningham

7. What RMR equation do you most frequently use? Select one.

- a. Kcal per kg body weight
- b. Harris-Benedict
- c. Mifflin-St. Jeor
- d. WHO/FAO
- e. Brandi
- f. Roth
- g. Faisy
- h. Fick
- i. Ireton-Jones
- j. Penn State
- k. Swinamer
- l. Owen
- m. Cunningham

8. Which equation(s) do you use for calculating energy needs for obese patients? Check all that apply.

- a. Kcal per kg body weight
- b. Harris-Benedict
- c. Mifflin-St. Jeor
- d. WHO/FAO
- e. Brandi
- f. Roth
- g. Faisy
- h. Fick
- i. Ireton-Jones
- j. Penn State
- k. Swinamer
- l. Owen
- m. Cunningham

9. Which equation(s) do you use for calculating energy needs for patients 65 and older? Check all that apply.

- a. Kcal per kg body weight
- b. Harris-Benedict
- c. Mifflin-St. Jeor
- d. WHO/FAO
- e. Brandi
- f. Roth
- g. Faisy
- h. Fick
- i. Ireton-Jones
- i. Penn State
- j. Swinamer
- k. Owen
- l. Cunningham

10. When calculating Calorie needs for obese patients, you use:

- a. Hamwi Ideal Body Weight
- b. Actual weight
- c. Adjusted Body Weight
- d. Other, please specify:

11. The equation(s) you use to calculate Caloric needs are ones primarily learned

- a. While in school
- b. From an experienced co-worker
- c. Through structured continuing education
- d. Through self-study
- e. Other, please specify:

12. Do you believe indirect calorimetry can practically be used in a healthcare setting?

- a. Yes
- b. No

If no, please explain:

13. You prefer to use information from the AND Evidence Analysis Library that is rated:

- a. Grade I
- b. Grade II
- c. Grade III
- d. Expert Opinion
- e. Not familiar with the Evidence Analysis Library

14. You believe “clinical judgement” can be trusted after working in a particular area of practice for

- a. 1-3 years
- b. 3-5 years
- c. 5-8 years
- d. 8-10 years

15. Are you aware of the inaccuracies and biases present in predictive equations for energy needs?

- a. Yes

b. No

If no, please explain:

16. Would you be interested in further standardization regarding use of RMR equations?

a. Yes

b. No

If no, please explain:

17. Do you believe one RMR equation can ever be capable of predicting accurate and unbiased energy needs for all patients?

a. Yes

b. No

If no, please explain:

18. Do you believe more accurate RMR estimation will improve patient outcomes?

a. Yes

b. No

If no, please explain:

19. (Optional) Provide your recommendations for how to calculate energy needs more accurately.