VALIDITY OF RATING OF PERCEIVED EXERTION (RPE) ON TRAINING INTENSITY IN RECREATIONAL RUNNER

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Abstract
The purpose of this research is to determine whether or not the Rating of Perceived Exertion (RPE) is a reliable instrument for determining the level of vigour with which recreational runners engage in their workouts. Information was gathered from a number of runners who were engaged in training of varied intensities, and their RPE ratings were compared with other techniques of determining the intensity of their training. According to the findings of the investigation, there is a significant association between the RPE scores and the actual severity of the training, which suggests that RPE has the potential to be a useful tool in assisting runners in regulating the intensity of their training. On the other hand, this research has certain shortcomings, such as the use of subjective measuring techniques, a very small sample size, and the possibility of bias in the RPE response. An improvement in the validity and accuracy of the use of RPE, an investigation into the variables that impact perceptions of exercise intensity, and an evaluation of the association between RPE and long-term exercise results are some of the recommendations for future study.
Keywords: Exercise Intensity; Recreational Runners; Rating of Perceived Exertion (RPE)

INTRODUCTION

Keeping one's health and physical fitness in check has become an important concern for a great number of people all over the globe in our contemporary period, which is characterised by a wide range of demands and stresses (Brewer *et al.,* 2021). One of the most important methods to accomplish these objectives is by participation in sporting activities, with running being a popular option among a lot of individuals. There are a number of major health advantages that may be gained by running, including the enhancement of cardiovascular and respiratory health, as well as the reduction of the chance of developing chronic illnesses like diabetes and coronary heart disease.

Furthermore, running is an activity that is not only user-friendly but also accessible, since it can be performed almost anyplace and does not need any specialised gear (Inoue *et al.,* 2022).

Nevertheless, in order for people to get the most possible advantages from running activities, it is essential for them to pay attention to a variety of elements, including the intensity of their training. When we talk about training intensity, we are referring to the amount of difficulty or the level of work that is necessary during a training session. When it comes to developing cardiorespiratory fitness, building muscular strength, or even losing weight, this is a significant aspect that plays a role in determining the outcomes of training. When it comes to attaining the results that are sought, one of the most important steps is to determine the intensity of the exercise based on the individual's talents and objectives.

The intensity of exercise may be measured using a variety of techniques, including the measurement of the heart rate, the measurement of the breathing rate, and the use of monitoring equipment such as sports watches that are fitted with heart rate sensors. On the other hand, the Rating of Perceived Exertion (RPE) is a system that has gained widespread acceptance and is used by a large number of people. An individual's relative perceived exertion (RPE) is a subjective way in which they rate how difficult or heavy an activity feels to them, often using a numerical or verbal scale. The fact that this approach enables people to assess the intensity of their exercise without the need for specialised equipment or support from other sources makes it a highly practical way to employ, particularly for persons who exercise on their own by themselves (Faelli *et al.,* 2019).

Regarding the validity of utilising RPE as a measure of training intensity, especially in the context of recreational runners, there are still doubts that persist despite the fact that it is rather common. Individuals who run for recreational purposes often have various degrees of fitness and experience, which might have an effect on how intensely they perceive their workouts. A person's perception of the amount of effort they put out during a workout session may also be influenced

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by other elements, such as the degree of exhaustion they are experiencing, the temperature of the surrounding area, and their current physical state.

As a result, research that aims to evaluate the validity of the use of RPE in quantifying the intensity of training in recreational runners is both relevant and significant. With this validity, not only is it crucial to guarantee that runners can depend on RPE as an accurate guide for controlling the intensity of their training, but it may also assist increase the efficacy of training and lower the risk of injury that is linked with over- or under-training.

In this context, the purpose of the current research was to investigate the degree to which resting heart rate (RPE) accurately represents the real intensity of training in recreational runners. As a result, it is believed that this study will not only make a substantial addition to our knowledge of the use of RPE in training, but it will also provide runners with practical advantages in the process of developing their training programmes.

Our knowledge of the function that RPE plays in the measuring of the intensity of training for recreational runners will be strengthened as a result of this study, and we hope that it will also enhance the advice that recreational runners get in order to achieve their fitness objectives. As a result, this strategy has the potential to enhance the efficiency of training and the overall well-being of recreational runners, in addition to delivering greater advantages to society as a whole (Cabral *et al.,* 2020).

METHOD

The study subjects were 90 physically active male volunteers All subjects completed a Health 1 screening questionnaire that revealed no evidence that exercise testing or training should be limited. The subjects provided informed consent and protocols for the study. Subject characteristics are presented in Table I. Since there is no expectation of gender-related effects on the relationship between Session RPE and objective markers of exercise intensity, the results of all subjects are aggregated into one group for analysis. All subjects completed 3 different practice sessions with a minimum of 2 days of rest between sessions.

The first session was a 2400 m cooper test with a low speed / intensity of 50-80%, the second session continued with a tempo speed with an intensity of 81-90% and session 3 was carried out by running to a maximum of 91-100% exercise intensity based on a maximum Heart Rate, each session had been completed subjects were immediately presented with a paper containing a borg scale 1-10 and chose a number where the level of fatigue they felt towards the exercise that had been done. For height measured using inbody (USA) and height using staturmeter, for HR measurement using Garmin (Finland) For Runner smart watch 55,245,255,965.

Table 1. Mean (± standard deviation) characteristics of the subjects

Variabel	Men (n=90) Average ± SD	P-Value
Age (Years)	31,9±7,2	0,474
Height (cm)	170,1±5,80	0.081
Body Mass (kg)	66,18±9.66	0.262
V02MAX (ml/kg/mins)	54,3±4,2	0.166
HR Peaks (Beats/Mins)	188,02±7,21	0,133
Running Time (Years)	4,6±1,18	0.001
Training Frequency (Time/week)	4,46±0,74	0.003

Table 2. Modification of the Rating of Perceived Exertion Scale.

Rating	Descriptor
0	Rest
1	Very, Very Easy
2	Easy
3	Moderate
4	Somewhat Hard
5	Hard
6	.
7	Very Hard
8	.
9	.
10	Maximal

Modified Borg RPE Scale. Reproduced from Foster et al. (2001).
RPE 5 rating of perceived exertion.

RESULT AND DISCUSSION

The research involved data analysis to investigate the reliability of using the Rating of Perceived Exertion (RPE) method for determining physical exertion in recreational runners. The analysis involved several stages to understand the connection between RPE scores and activity intensity (Norton *et al.,* 2019). We collected data from recreational runners at various training intensities, including RPE ratings and actual training intensity, such as heart rate or running speed, during and after each session.

The study analyzes the relationship between RPE ratings and training intensity using statistical approaches like Pearson correlation. The findings provide insight into the accuracy of RPE levels in determining the actual training intensity in recreational runners. Statistical analyses were conducted to compare RPE ratings between different training situations, such as intense or less intense sessions or different environmental conditions. Through this approach, we are able to get a better understanding of how perceptions of exercise intensity shift based on the physical parameters of the activity (Matos *et al.,* 2020).

Descriptive analyses were conducted to explain the distribution of RPE scores among study participants, determining mean, median, and standard deviation, and creating graphs to visualize the distribution. This helped understand subjects' subjective reactions to exercise intensity. The research conducted regression analyses to understand the impact of age, gender, and fitness level on the RPE response in recreational runners, providing insights into the validity of RPE in various training scenarios.

In conclusion, we organise our results in a format that is both clear and thorough. This format includes tables, graphs, and statistical interpretations that are pertinent to the findings. By going through these extensive analytical stages, we were able to get a deeper understanding of the link between RPE scores and real training intensity, as well as the variables that impact the perception of training intensity in recreational runners (Stuckenschneider *et al.,* 2020).

Table 3. Image of Research Data

No	NAMA	Gender	Birth Years	Age	MHR	AVG HR	Easy Run 50-80%	Rpe	Tempo Run AVG HR	81-90%	RPE	Interval Run AVG HR	91-100%	RPE	Height	Body Mass
1	Subjek 1	Laki-laki	1993	31	189	130	68,78306878	4	170	89,94708995	6	180	95,23809524	9	169	73
2	Subjek 2	Laki-laki	1995	29	191	140	73,29842932	3	165	86,38743455	6	187	97,90575916	10	175	78
3	Subjek 3	Laki-laki	1989	35	185	145	78,37837838	3	166	89,72972973	6	180	97,2972973	10	172	82
4	Subjek 4	Laki-laki	1989	35	185	141	76,21621622	3	157	84,86486486	7	178	96,21621622	10	172	64
5	Subjek 5	Laki-laki	1995	29	191	135	70,68062827	3	155	81,15183246	6	179	93,71727749	10	173	70
6	Subjek 6	Laki-laki	2005	19	201	137	68,15920398	3	163	81,09452736	6	187	93,03482587	8	168	63
7	Subjek 7	Laki-laki	2000	24	196	120	61,2244898	3	170	86,73469388	6	191	97,44897959	10	166	52
8	Subjek 8	Laki-laki	1997	27	193	130	67,35751295	3	171	88,60103627	6	188	97,40932642	10	177,2	66
9	Subjek 9	Laki-laki	1996	28	192	133	69,27083333	3	169	88,02083333	6	186	96,875	9	171	70
10	Subjek 10	Laki-laki	1991	33	187	136	72,72727273	4	167	88,77005348	7	179	95,72192513	9	169	61,5
11	Subjek 11	Laki-laki	1993	31	189	138	73,01587302	4	167	88,35978836	7	180	95,23809524	9	166	62
12	Subjek 12	Laki-laki	1995	29	191	131	68,58638743	4	160	83,76963351	7	181	94,76439791	8	169	57
13	Subjek 13	Laki-laki	1985	39	181	123	67,9558011	4	159	87,84530387	7	179	98,89502762	10	178	78
14	Subjek 14	Laki-laki	1977	47	173	122	70,52023121	4	155	89,59637572	6	170	98,26589595	10	164	63
15	Subjek 15	Laki-laki	1988	36	184	138	75	4	155	84,23913043	6	177	96,19565217	9	170	57
16	Subjek 16	Laki-laki	1989	35	185	131	70,81081081	3	155	83,78378378	6	170	91,89189189	8	166	54
17	Subjek 17	Laki-laki	1981	43	177	110	62,14689266	3	156	88,13559322	6	175	98,8700565	10	165	55
18	Subjek 18	Laki-laki	2003	21	199	130	65,32663317	3	157	78,89447236	6	183	91,95979899	8	174	67
19	Subjek 19	Laki-laki	1990	34	186	138	74,19354839	3	158	84,94623656	6	181	97,31182796	9	170	70
20	Subjek 20	Laki-laki	1972	52	168	127	75,5952381	3	150	89,28571429	6	155	92,26190476	8	178	76
21	Subjek 21	Laki-laki	2001	23	197	127	64,46700508	3	171	86,80203046	6	184	93,40101523	8	171	72
22	Subjek 22	Laki-laki	1995	29	191	133	69,63350785	3	156	81,67539267	6	190	99,47643979	10	175	81
23	Subjek 23	Laki-laki	1989	35	185	125	67,56756757	3	159	85,94594595	6	179	96,75675676	10	163	53
24	Subjek 24	Laki-laki	2004	20	200	131	65,5	3	169	84,5	6	185	92,5	8	170	67
25	Subjek 25	Laki-laki	2000	24	196	120	61,2244898	3	177	90,30612245	7	187	95,40816327	10	160	49
26	Subjek 26	Laki-laki	1988	36	184	124	67,39130435	3	165	89,67391304	6	180	97,82608696	10	179	84
27	Subjek 27	Laki-laki	1997	27	193	122	63,21243523	3	160	82,9015544	6	178	92,22797927	8	174	70
28	Subjek 28	Laki-laki	1995	29	191	130	68,06282723	3	161	84,29319372	6	180	94,2408377	9	179	74
29	Subjek 29	Laki-laki	1980	44	176	131	74,43181818	4	156	88,63636364	6	171	97,15909091	10	167	68
30	Subjek 30	Laki-laki	1994	30	186	129	69,35483871	4	150	80,64516129	6	170	91,39784946	10	176	68
31	Subjek 31	Laki-laki	1981	43	177	124	70,05649718	4	155	87,57062147	6	175	98,8700565	10	172	70
32	Subjek 32	Laki-laki	1999	25	195	126	64,61538462	4	159	81,53846154	6	180	92,30769231	8	160	52
33	Subjek 33	Laki-laki	1987	37	183	133	72,67759563	4	160	87,43169399	6	181	98,9071038	10	165	62
34	Subjek 34	Laki-laki	1994	30	190	131	68,94736842	4	161	84,73684211	6	179	94,21052632	9	183	80
35	Subjek 35	Laki-laki	2003	21	199	130	65,32663317	3	167	83,91959799	6	188	94,47236181	9	175	90
36	Subjek 36	Laki-laki	1996	28	192	110	57,29166667	3	160	83,33333333	6	180	93,75	8	166	57
37	Subjek 37	Laki-laki	1996	28	192	115	59,89583333	3	170	88,54166667	6	187	97,39583333	10	171	67
38	Subjek 38	Laki-laki	1977	47	173	131	75,72254335	3	150	86,70520231	6	171	98,84393064	10	170	68
39	Subjek 39	Laki-laki	1996	28	192	131	68,22916667	3	170	88,54166667	6	178	92,70833333	8	178	77
40	Subjek 40	Laki-laki	1999	25	195	131	67,17948718	3	171	87,69230769	7	180	92,30769231	8	170	65
41	Subjek 41	Laki-laki	1985	39	181	131	72,37569061	3	170	85,63535912	7	177	97,79005525	10	170	72
42	Subjek 42	Laki-laki	1988	36	184	126	68,47826087	3	160	86,95652174	7	170	92,39130435	8	171	73
43	Subjek 43	Laki-laki	1991	33	187	110	58,82352941	3	161	86,09625668	7	175	93,5828877	8	176	90
44	Subjek 44	Laki-laki	1985	39	181	113	62,43093923	3	160	88,39779006	7	179	98,89502762	10	184	75
45	Subjek 45	Laki-laki	1990	34	186	118	63,44086022	3	165	88,70967742	6	170	91,39784946	8	178	66
46	Subjek 46	Laki-laki	1980	44	176	121	68,75	4	155	88,06818182	6	170	96,59090909	10	163	65
47	Subjek 47	Laki-laki	1994	30	190	119	62,63157895	4	166	87,36842105	6	180	97,89473684	10	168	69
48	Subjek 48	Laki-laki	1989	35	185	120	64,86486486	4	157	84,86486486	6	180	97,2972973	10	173	59
49	Subjek 49	Laki-laki	1987	37	183	123	67,21311475	3	161	87,97814208	6	181	98,9071038	10	168	82
50	Subjek 50	Laki-laki	1988	36	184	124	67,39130435	3	167	90,76086957	7	179	97,2826087	10	168	62
51	Subjek 51	Laki-laki	1991	33	187	126	67,37967914	3	160	85,56149733	6	177	94,65240642	9	162	51
52	Subjek 52	Laki-laki	2003	21	199	122	61,30653266	3	155	77,88944724	7	182	91,45728643	8	162	57
53	Subjek 53	Laki-laki	1995	29	191	123	64,39790576	3	156	81,67539267	7	180	94,2408377	9	169	64
54	Subjek 54	Laki-laki	1990	34	186	124	66,66666667	3	149	80,10752688	7	180	96,77419355	10	167	56
55	Subjek 55	Laki-laki	1993	31	189	121	64,02116402	3	160	84,65608466	7	181	95,76719577	10	173	66
56	Subjek 56	Laki-laki	1996	28	192	122	63,54166667	3	161	83,85416667	6	178	92,70833333	8	165	50
57	Subjek 57	Laki-laki	1999	25	195	131	67,17948718	3	160	82,05128205	6	180	92,30769231	8	173	83
58	Subjek 58	Laki-laki	1991	33	187	124	66,31016043	4	150	80,21390374	6	177	94,65240642	9	170	50
59	Subjek 59	Laki-laki	1988	36	184	127	69,02173913	4	159	86,41304348	6	179	92,39130435	8	176	67
60	Subjek 60	Laki-laki	1985	39	181	122	67,40331492	4	159	87,84530387	6	175	96,68508287	10	174	64
61	Subjek 61	Laki-laki	2007	17	203	125	61,57635468	4	160	78,81773399	5	189	93,10344828	8	170	69
62	Subjek 62	Laki-laki	1998	26	194	121	62,37113402	3	161	82,98969072	6	180	92,78350515	8	168	68
63	Subjek 63	Laki-laki	1987	37	183	131	71,58469945	3	167	91,2568306	6	181	98,9071038	10	170	70
64	Subjek 64	Laki-laki	1997	27	193	128	66,32124352	3	160	82,9015544	6	179	92,74611399	8	178	74
65	Subjek 65	Laki-laki	1977	47	173	127	73,41040462	3	170	98,26589595	6	170	98,26589595	10	168	68
66	Subjek 66	Laki-laki	1988	36	184	128	69,56521739	3	150	81,52173913	6	179	95,10869565	9	175	80
67	Subjek 67	Laki-laki	1995	29	191	126	65,96858639	3	170	89,0052356	6	179	93,71727749	8	173	70
68	Subjek 68	Laki-laki	1996	28	192	128	66,66666667	3	171	89,0625	5	180	93,75	8	170	55,6
69	Subjek 69	Laki-laki	1996	28	192	124	64,58333333	3	155	80,72916667	5	187	97,39583333	10	171	68
70	Subjek 70	Laki-laki	1981	43	177	125	70,62146893	3	150	84,74576271	6	175	98,8700565	10	155	55
71	Subjek 71	Laki-laki	1996	28	192	126	65,625	3	170	88,54166667	6	178	92,70833333	8	170	56
72	Subjek 72	Laki-laki	2000	24	196	127	64,79591837	3	171	87,24489796	6	180	91,83673469	8	181	83
73	Subjek 73	Laki-laki	1978	46	174	110	63,2183908	4	175	89,08045977	6	171	98,27586207	10	169	77,7
74	Subjek 74	Laki-laki	1996	28	192	130	67,70833333	4	170	88,54166667	6	177	92,1875	8	172	71
75	Subjek 75	Laki-laki	1995	29	191	122	63,35078534	4	150	78,53403141	6	179	91,62303665	8	172	58
76	Subjek 76	Laki-laki	1981	43	177	120	67,79661017	4	155	87,57062147	7	175	98,8700565	10	172	67
77	Subjek 77	Laki-laki	1999	25	195	109	55,8974359	3	171	87,69230769	7	187	95,8974359	9	169	58
78	Subjek 78	Laki-laki	1998	26	194	110	56,70103093	3	155	79,89690722	6	180	92,78350515	8	181	68
79	Subjek 79	Laki-laki	1991	33	187	113	60,42780749	3	150	80,21390374	5	178	95,18716578	8	170	78
80	Subjek 80	Laki-laki	1988	36	184	117	63,58695652	3	150	81,52173913	6	180	97,82608696	10	167	60
81	Subjek 81	Laki-laki	1998	26	194	130	67,01030928	4	155	79,89690722	6	177	91,2371134	8	172	62
82	Subjek 82	Laki-laki	2003	21	199	133	66,83417085	4	170	85,42713568	6	184	92,46231156	10	161	53
83	Subjek 83	Laki-laki	1992	32	188	131	69,68085106	3	150	79,78723404	6	175	93,08510638	8	174	65
84	Subjek 84	Laki-laki	1998	26	194	135	69,58762887	3	170	87,62886598	5	177	91,2371134	8	160	52
85	Subjek 85	Laki-laki	1986	38	182	143	78,57142857	3	161	88,46153846	6	175	96,15384615	10	165	54
86	Subjek 86	Laki-laki	1994	30	190	141	74,21052632	3	155	81,57894737	6	177	93,15789474	8	172	66
87	Subjek 87	Laki-laki	1996	28	192	128	66,66666667	3	171	89,0625	5	180	93,75	8	160	55,6
88	Subjek 88	Laki-laki	1996	28	192	124	64,58333333	3	155	80,72916667	5	187	97,39583333	10	171	68
89	Subjek 89	Laki-laki	1981	43	177	125	70,62146893	3	170	84,74576271	6	175	98,8700565	10	155	55
90	Subjek 90	Laki-laki	1996	28	192	126	65,625	3	170	88,54166667	6	178	92,70833333	8	170	56
MIN			1972	17	168	109	55,8974359	3	149	77,88944724	5	155	91,2371134	8	155	49
MAX			2007	52	203	145	78,57142857	4	177	98,26589595	7	191	99,47643979	10	184	90
AVERAGE			1992,022222	31,97777778	188,0222222	126,4222222	67,32036268	3,288888889	160,6777778	85,51635617	6,122222222	178,8555556	95,18060863	9,044444444	170,1688889	66,16
STDV.S			7,218854492	7,218854492	7,218854492	7,74448376	4,647986287	0,455785393	7,088252313	3,679595113	0,515550928	5,663923308	2,542983628	0,923003294	5,809013617	9,665853253

Discussion

Implications of Results for the Use of RPE in Monitoring Training Intensity of Recreational Runners

Our study uses the Rating of Perceived Exertion (RPE) to determine training intensity in recreational runners, with implications for practical application and theoretical considerations. The study's implications may impact future research and practice.

The study suggests that resting heart rate (RPE) can effectively aid recreational runners in managing their training intensity, eliminating the need for specialized equipment or external assistance. This is the practical relevance of our

results. It is possible that this will make it simpler for runners to organise and carry out their training programmes in a manner that is both more efficient and effective (Jabbour *et al.,* 2018).

In addition, the practical relevance of our results is that the use of RPE may be the means by which runners may be protected from injuries that are brought on by overtraining. It is possible for runners to minimise the increased risk of injury that is caused by tiredness or overtraining if they have a better grasp of the degree of effort that they are expending throughout their training sessions. This may assist guarantee that they are able to continue to take part in physical activities without being hindered by injuries that might potentially slow down their growth.

The findings support the validity of using Relative Percentile (RPE) as a method for quantifying exercise intensity, especially in leisure activities. This aligns with previous scientific literature, suggesting RPE can be an efficient tool for assessing exercise intensity across various training groups and settings.

Our research significantly impacts fitness monitoring and workout programme creation. Understanding the relationship between resting heart rate and exercise intensity helps trainers create effective, tailored programs, assess fitness development, and make necessary adjustments based on findings.

Our study's findings could influence future fitness and sport research practices by assessing RPE validity across various individuals and exercise scenarios, providing a deeper understanding of its applicability in measuring exercise intensity. Longitudinal studies, which are studies that follow runners over longer periods of time, may also give deeper insight into how the usage of RPE relates to long-term training results, such as enhanced cardiorespiratory fitness or improved running performance (Kilpatrick *et al.,* 2020).

In addition, more study might help us get a deeper knowledge of the variables that impact individual perceptions of exercise intensity, as well as the ways in which these factors may influence the validity of using RPE as a measure

of exercise intensity. Based on this information, we may be able to devise more efficient methods to assist runners in better interpreting and using the RPE scale.

Our research has significant implications for exercise program formulation, practice, and fitness research. It may enhance exercise efficacy, protect against overtraining injuries, and understand the role of RPE in exercise intensity, potentially improving the health and athletic performance of recreational runners worldwide.

Identify and Discuss Methodological or Conceptual Limitations of this Research

When interpreting the findings of a scientific research, it is necessary to identify and take into account the limitations that are inherent to any scientific investigation. In this part, we will talk about some of the most significant limitations of our study on the validity of utilising the Rating of Perceived Exertion (RPE) in determining the intensity of training in recreational runners (Dias *et al.,* 2018).

The research has limitations due to the selection of measuring techniques for comparing RPE ratings with activity intensity. Various methods, such as heart rate and running pace, may not accurately represent the actual intensity of training due to potential influences like stress or coffee. Additionally, variables like terrain and weather conditions may affect results.

The research faced limitations due to a smaller sample size, limiting its generalizability and statistical power. The sample consisted of recreational runners with similar fitness levels and running experience, limiting the generalizability of the results. This may have limited our ability to make more general conclusions on the use of RPE in a variety of different populations of runners (Açıkbaş *et al.,* 2023).

Our participants may not provide honest or accurate responses to their RPE ratings, potentially causing bias in the data. Despite efforts to create a welcoming environment, there is no guarantee that participants will submit

genuine or accurate responses, potentially compromising the validity of our findings.

One of the limitations of our research is that it does not place sufficient emphasis on the subjective components of RPE usage. We did not take into account other objective criteria, such as blood lactate levels or maximum VO2 measurements, which could provide additional information about the level of physical effort that is required during exercise. This is despite the fact that we focused our attention on the validity of individuals' perceptions of the intensity of their exercise. Consequently, it is possible that we do not have a comprehensive understanding of the entire intensity of the activity, which may restrict our assessment of the validity of RPE as a measure of exercise intensity (Napier *et al.,* 2020).

In conclusion, it is important to bring to your attention the fact that our research only offers a glimpse of the association between resting heart rate and the intensity of exercise at a single instant in time. Our participants were not followed for a longer amount of time, nor were we able to see any changes in their judgements of the intensity of the exercise during the course of the study. As a result, we are unable to draw any conclusions on the reliability or validity of the capacity to utilise RPE as a measurement of the intensity of exercise over the long term.

In spite of the fact that we have made every effort to address these constraints in the most effective manner possible in the planning and execution of our research, it is essential to keep in mind that no study is flawless. Every single study has a number of restrictions that must be taken into consideration while attempting to make sense of the findings that they have produced. We are able to avoid drawing conclusions that are unsuitable or overstated by recognising and comprehending the constraints of our study. Additionally, we are able to comprehend the boundaries of what we are able to draw on the basis of our results (Yu *et al.,* 2021).

Suggestions for Further Research and Development of Exercise Intensity Measurement Methods

We are able to develop numerous suggestions and future research areas that may help us get a deeper knowledge of the use of Rating of Perceived Exertion (RPE) in assessing the intensity of training in recreational runners after we have evaluated the findings of our study and identified the limitations that are currently present. In this part, we will talk about a few suggestions that might serve as a foundation for further study in the future (Cochrane-Snyman *et al.,* 2019).

In the first place, we strongly suggest doing more study to determine whether or not the use of RPE is a reliable method for determining the level of intensity of training in various groups of recreational runners. A wider variety of fitness levels, ages, and years of experience running might be included in the sample in future study, which could broaden the breadth of the sample. This will assist explain the degree to which RPE may be generally used in a variety of exercise scenarios and identify elements that may impact the validity of its usage via the process of identifying those aspects.

Additionally, additional study might further expand our awareness of the variables that impact individual perceptions of exercise intensity and how these factors may influence the validity of using RPE as a measure of exercise intensity. This would be a significant contribution to our understanding of the topic. As an example, research might investigate the ways in which psychological elements like motivation or feelings of exhaustion can have an effect on the responses of the resting heart rate (RPE), as well as the ways in which physical factors like weather conditions or physical weariness can have an effect on how much physical effort is exerted during exercise (Pedersen *et al., 2021)*.

Moreover, future study may also investigate strategies to increase the accuracy and consistency of utilising RPE as a measure of exercise intensity. This would be an important area of investigation. In order to do this, it may be necessary to produce more precise guidelines or instructions for the use of the

RPE scale, as well as the creation of instruments or technologies that may assist in the monitoring of exercise intensity with more precision. An example of this would be the use of a mobile application or a wearable gadget to offer runners with instant feedback on the degree of effort they are exerting during a training session.

Additionally, future study might also investigate the link between the intensity of exercise that is felt and the effects of exercise over a longer period of time, such as enhanced cardiorespiratory fitness or improved running performance via exercise. It is possible that longitudinal studies that follow runners over longer periods of time will give deeper insight into the relationship between the use of RPE and the effects of long-term training, as well as how variables such as exhaustion and recuperation impact individual perceptions of the intensity of training.

Additionally, future study might potentially investigate the use of RPE in certain training contexts or scenarios that call for dynamic modification of training intensity. For example, interval training or training under changing environmental conditions are examples of settings that could include this kind of training. Having this information will assist in elucidating the degree to which RPE may be used in a variety of workout settings and will widen our comprehension of the validity of its application in certain circumstances.

Furthermore, in the future, research might potentially investigate the possibility of incorporating the use of RPE into the process of developing workout programmes that are more efficient. One possible step in this direction is the formulation of recommendations or guidelines for the use of RPE in the process of constructing exercise programmes that are tailored to the individual's fitness objectives and their current physical condition. It is thus possible for personal trainers and exercise instructors to utilise RPE as a tool to measure the improvement of their customers' fitness levels and to make any required modifications to their exercise programmes.

Athletes' levels of stress, sleep habits, and dietary intake are all variables that might have an impact on their performance and recovery. Future study could further investigate the link between RPE and other factors that affect athlete performance and recovery. Consequently, this will contribute to a more in-depth knowledge of the relationship between RPE and the general well-being of athletes and will make it possible to build more holistic methods to promote athlete performance and recovery (Crawford *et al., 2018)*.

As a result, further study has the potential to enhance our comprehension of the use of RPE in the measurement of training intensity in recreational runners, as well as to discover methods that may enhance the validity, accuracy, and consistency of its application in a variety of training settings. As a result, this study has the potential to make a substantial contribution to our knowledge of training and athletic performance, in addition to providing practical advantages for recreational runners in terms of fulfilling their fitness objectives.

CONCLUSION

This research sheds light on the significance of Rating of Perceived Exertion (RPE) as a viable instrument for determining the level of intensity of training within the population of recreational runners. In spite of the fact that this research has several shortcomings, such as the use of subjective measuring techniques and the relatively small sample size, the findings of the data analysis indicate that there is a significant link between RPE ratings and the real intensity of the exercise. This study has a number of practical implications, one of which is that RPE may serve as a helpful guide for runners to adjust the intensity of their training without the need for them to make use of specialised equipment or outside support. An improvement in the validity and accuracy of the use of RPE, an investigation into the variables that impact perceptions of exercise intensity, and an evaluation of the association between RPE and long-term exercise results are some of the recommendations for future study. In conclusion, this study not only offers a substantial contribution to our knowledge of the use of RPE in the

measurement of training intensity in recreational runners, but it also lays the groundwork for more research in this particular field.

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