

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LULULEMON ATHLETICA CANADA INC.
and LULULEMON USA INC.
Petitioner,

v.

NIKE, INC.,
Patent Owner.

Patent No. 8,620,413

Inter Partes Review No. IPR2023-00438

REPLY DECLARATION OF DR. KEVIN LYNCH, PH.D.

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	CLAIM CONSTRUCTION	2
A.	A POSITA Would Have Understood “wherein an exertion level is based on a level of physical fitness of a user” According to Its Ordinary and Customary Meaning.....	3
III.	AMANO	7
A.	Amano Teaches “prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of physical fitness of a user” (Limitation [1C]).....	7
B.	Amano Teaches “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels” (Limitation [1D]).....	14
C.	Amano’s First, Fourth, and Eighth Embodiments Are Not Distinct Embodiments	15
D.	Amano Teaches Dependent Claims 5 and 7	16
IV.	AMANO AND GORMAN/FLACH	16
A.	The Dependent Claims Encompass Both Wired and Wireless Communications.....	16
B.	A POSITA Would Have Combined Amano and Gorman/Flach	17
V.	MATSUMOTO.....	20
A.	Matsumoto Teaches “prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of physical fitness of a user” (Limitation [1C])	20
B.	Matsumoto Teaches “a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels” (Limitation [1D]).....	21
1.	Matsumoto teaches a plurality of heart rate zones.....	21
2.	Matsumoto teaches heart rate zones and heart rate measurements in the same embodiment	22

C.	Matsumoto Teaches “determin[ing] whether the second heart rate measurements are within the particular heart rate zone” (Limitation [1G]).....	25
D.	Matsumoto Teaches Dependent Claims 5 and 7	26
VI.	MATSUMOTO AND GORMAN/FLACH.....	26
VII.	LUBELL AND CECI	28
A.	A POSITA Would Have Combined Lubell and Ceci	28
1.	Lubell does not teach away from using a self-regulated protocol	30
2.	A POSITA would have combined Lubell and Ceci with a reasonable expectation of success.....	31
B.	Lubell and Ceci Teach “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels” (Limitation [1D]).....	32
VIII.	LUBELL-CECI AND GORMAN/FLACH.....	33

I, Kevin Lynch, make this reply declaration in connection with the proceeding identified above.

I. INTRODUCTION

1. I have been retained by counsel for lululemon athletica canada inc. and lululemon usa inc. (collectively, “lululemon” or “Petitioner”) as a technical expert in connection with the proceeding identified above. I submit this reply declaration in support of lululemon’s Reply to Nike’s Patent Owner Response in the *Inter Partes* Review of U.S. Patent No. 8,620,413 (“the ’413 patent”) (EX1001). I described my qualifications in detail in my opening declaration dated January 4, 2023, which I understand is Exhibit 1009 to this proceeding. (January 4, 2023, Lynch Decl. (EX1009.)

2. I am being compensated at my standard consulting rate. I am also being reimbursed for expenses that I incur during my work. My compensation does not depend on the results of my study and analysis, the substance of my opinions, or the outcome of any proceeding involving the Challenged Claims. I have no personal or financial interest in the outcome of this matter or in any litigation involving the ’413 patent.

3. I have personal knowledge of the facts and opinions set forth in this declaration and believe them to be true. If called upon to do so, I would testify

competently thereto. I have been warned that willfully false statements (and the like) are punishable by fine or imprisonment or both.

4. Although I am not a lawyer and will not provide any legal opinions, I have been advised to apply certain legal standards in forming my opinions. I set forth my understanding of those legal standards in my opening declaration. (EX1009, ¶¶14-19, 41-43.)

5. I understand that Nike and/or Dr. Bergeron have argued that the prior art does not teach certain limitations of the Challenged Claims of the '413 patent, including under their proposed constructions of “wherein an exertion level is based on a level of physical fitness of a user.” (EX1001, 18:11-12 (Claim 1, in part).) I offer the following opinions in response.

II. CLAIM CONSTRUCTION

6. I understand that Nike proposes construing “wherein an exertion level is based on a level of physical fitness of a user” as “an exertion level that takes into account an individual user’s particular physical fitness condition, as assessed by fitness condition criteria such as cardiorespiratory endurance.” (POR, 19-20.) I understand that Nike’s expert, Dr. Bergeron, proposes the same construction for this term. (EX2008, ¶27.) I disagree with their construction for the reasons set forth below.

A. A POSITA Would Have Understood “wherein an exertion level is based on a level of physical fitness of a user” According to Its Ordinary and Customary Meaning

7. A POSITA would have understood that the ordinary and customary meaning of “wherein an exertion level is based on a level of physical fitness of a user” is “wherein an exertion level is adaptive to a user’s physical fitness.” This construction is supported by both intrinsic evidence, particularly the prosecution history (EX1014, 8), and extrinsic evidence from the perspective of a POSITA.

8. With respect to the intrinsic evidence, the ’413 specification exemplarily describes setting an exertion level based on cardiorespiratory endurance, measured by a user’s physical attributes, such as the user’s heart rate or breathing. As the specification describes, “an easy level of [exertion] is one that only slightly elevates the user’s heart rate. This level of exercise should not feel challenging, but should instead feel as if the user is performing a warm-up routine, so that the user feels at ease. The user should be able to maintain this workout intensity for approximately 30 minutes to one hour with his or her breathing only slightly greater than when the user began exercising.” (EX1001, 15:54-61.) The specification also provides similar descriptions for a “medium level of exertion” at 16:18-23 and a “hard level of exertion” at 16:48-55. (*Id.*, 16:18-23, 16:48-55.)

9. In terms of the prosecution history, the Examiner rejected the claims over Lubell. The Applicants then argued that Lubell’s test protocol is

“predetermined” and not “adaptive to the physical fitness of a user,” and this distinction was reflected by amending the claims with the disputed limitation. (EX1014, 8; EX2012 (Lynch Sept. 27, 2023 deposition), 113:20-22 (“So I understand the addition of this language to try to address making the test protocol adaptive to the physical fitness of a user.”).) Lubell’s predetermined protocol is: “the subject, wearing the device, is paced to run at speeds of approximately four miles per hour for the first three minutes, and then at six miles per hour, eight miles per hour, ten miles per hour, twelve miles per hour, and fourteen miles per hour for the successive three minute intervals.” (Ex.1004, 3:59-63.) That is, because every user runs at the same speed for the same amount of time (four miles per hour for the first three minutes, six miles per hour for the next three minutes, eight miles per hour for the next three minutes, etc.), Lubell’s protocol is “not adaptive to the physical fitness of a user.” (EX1014, 8.)

10. With respect to extrinsic evidence, as an example, Nike’s own evidence, Caspersen and the Surgeon General Report, describes “physical fitness.” Caspersen describes the five “components” of health-related physical fitness to be cardiorespiratory endurance, muscular endurance, muscular strength, body composition, and flexibility. (EX2009, 128.) It provides that “physical fitness” is “a set of attributes that people have or achieve that relates to the ability to perform physical activity,” and the Surgeon General Report adopted Caspersen’s

understanding. (*Id.*; EX2010, 21.) These attributes “can be measured with specific tests.” (EX2009, 126.) Measurable attributes of physical fitness include a user’s maximum oxygen uptake, body mass index, and others. (*Id.*, 129.) As I testified in my deposition on September 27, 2023 in this proceeding, a level of physical fitness “is obviously a very broad term that relates to a person’s ability to perform physical exercise and relates to characteristics of that person, like their body mass index or their weight or their age or their stride length or many other aspects.” (EX2012 (Lynch Sept. 27, 2023 deposition), 114:2-7.) I further note that Dr. Bergeron agreed with Caspersen’s and the Surgeon General Report’s understanding of “physical fitness” as a “set of attributes that people have or achieve that relates to the ability to perform physical activity.” (EX2008, ¶24; EX1017 (Bergeron Dec. 21, 2023 deposition), 46:17-47:5.)

11. Caspersen also describes physical fitness as levels: “[n]o person has no fitness—all are active or fit to greater or lesser degrees.” (EX2009, 130.) Thus, a construction of “wherein an exertion level is based on a level of physical fitness of a user” as “wherein an exertion level is adaptive to a user’s physical fitness” would reflect the user’s level of physical fitness.

12. Other extrinsic evidence supports my construction. For example, Matsumoto designed “an exercise program that is suited to the individual user’s physical fitness.” (EX1003, 4:33-35.) In doing so, Matsumoto uses the user’s sex,

age, and weight as measurable physical attributes to design the exercise program suited to the individual user's physical fitness. (*Id.*, 3:4-18.) A POSITA would understand weight to be a measurable physical attribute related to a level of physical fitness of a user. (EX2010, 35 (“body composition has been estimated by measuring body height and weight and calculating body mass index (weight/height²)”).) In addition, the Surgeon General Report notes that cardiorespiratory fitness is “*largely* determined by habitual activity, but other factors influence cardiorespiratory fitness, including age, sex, heredity, and medical status.” (*Id.*, 33 (emphasis added).)

13. Dr. Bergeron argues that physical characteristics such as height, weight, sex, and stride length do not by themselves indicate a person's level of physical fitness. (EX2008, ¶29.) To support his argument, Dr. Bergeron relies on the specification's passage at 15:7-10, which states that heart rate monitors “typically require[] that the athlete employ a mathematical formula incorporating the athlete's sitting heart rate, the athlete's age, and a general estimate of the athlete's fitness condition.” (EX1001, 15:7-10.) However, this passage does not suggest that these physical attributes, including sitting heart rate and the athlete's age, cannot be indicators of a user's physical fitness. Even Dr. Bergeron agreed that sitting heart rate is an indicator of cardiorespiratory endurance, which I understand reflects a user's physical fitness according to Nike. (EX1017 (Bergeron Dec. 21, 2023 deposition), 28:3-9; POR, 25.)

III. AMANO

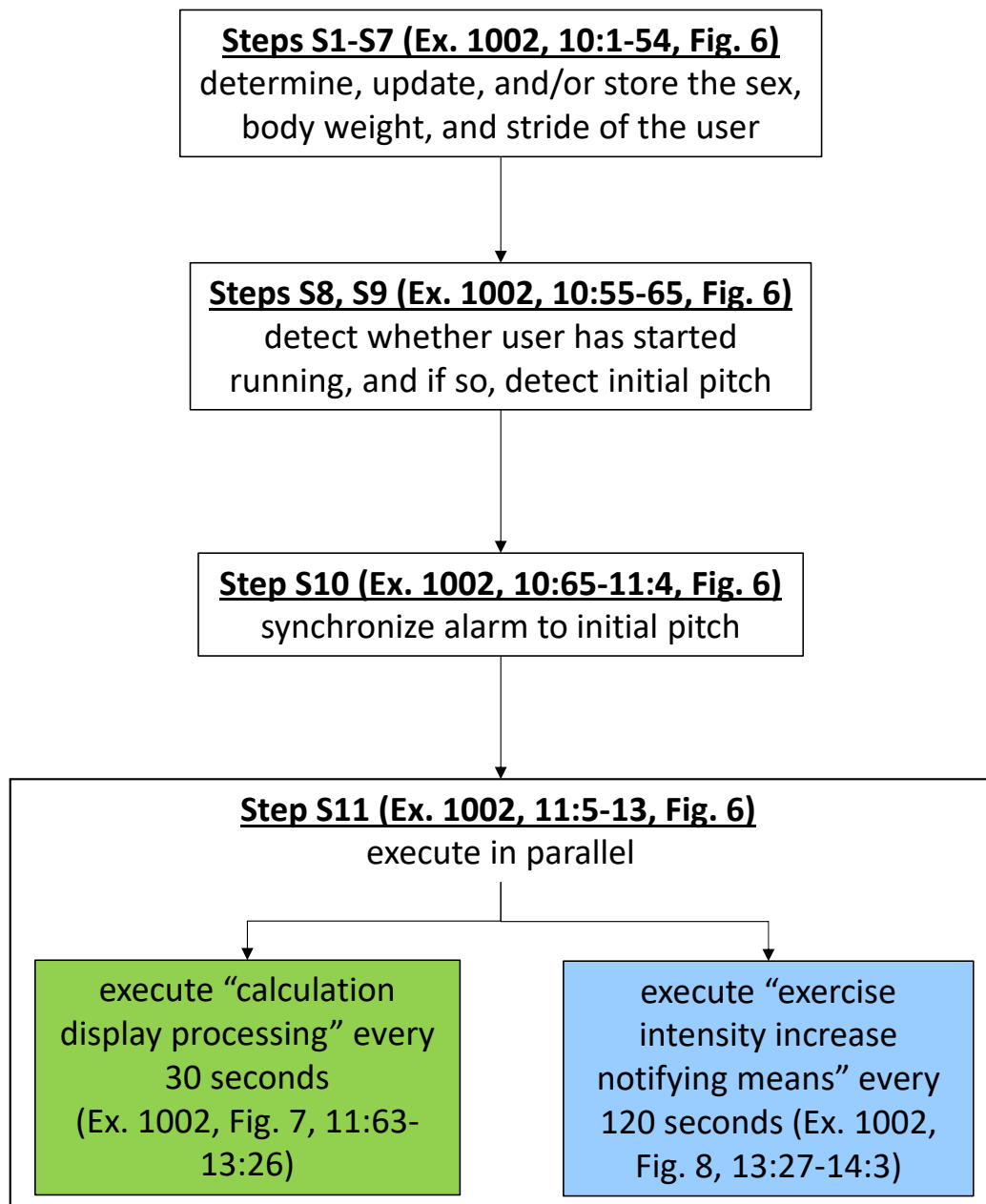
A. Amano Teaches “prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of physical fitness of a user” (Limitation [1C])

14. Amano consistently describes “exercise intensity” in units of power, which can be expressed in the SI units of Watts or the currently less standard unit of kpm/min (used in the Astrand-Ryhming nomogram of EX1002, Fig. 3), where $1 \text{ kpm/min} = 0.1653 \text{ W}$. (EX1002, 8:17-20.) In running, for example, exercise intensity is obtained as the product of the user’s weight by their speed. Speed is obtained as the product of the user’s pitch and stride length. (*Id.*, 7:30-37, 12:15-21.)

15. Below I provide a flowchart that depicts an overview of Amano’s operation as described in Section “1.2 Operation of the embodiment.” (*Id.*, 9:58-14:3). In steps S1-S7, Amano determines, updates, and/or stores the sex, body weight, and stride (stride length) of the user. (*Id.*, 10:1-54.) In step S8, Amano detects whether the user has started running, and if so, in step S9, detects the initial pitch of the user running. (*Id.*, 10:55-65.) In step S10, an alarm generates an alarm sound corresponding to the detected pitch. (*Id.*, 10:65-11:4.) Then, in step S11, two processes, or interrupt service routines, begin to execute in parallel: (1) “calculation display processing” and (2) “exercise intensity increase” notifying means. (*Id.*, 11:5-13.) The “**calculation display processing**” process (figure below) calculates an exercise intensity-beat pair every 30 seconds to obtain least three exercise intensity-

beat rate pairs forming a straight line relationship, as described at 11:63-13:26. (*Id.*, 11:63-13:26, Fig. 4.) The “**exercise intensity increase notifying means**” prompts the user to increase exercise intensity every 120 seconds and is described at 13:27-14:3. (*Id.*, 13:27-14:3.)

Overview of Amano's Operation



16. The steps of Amano's "**calculation display processing**" are:

Step Sa1	determine the user's pulse rate (beat rate) (<i>id.</i> , 12:9-11)
Step Sa2	detect the running pitch of the user (<i>id.</i> , 12:12-14) (same as step S9)
Step Sa3	calculate exercise intensity as the product of the pitch (detected in step Sa2), stride length, and body weight (<i>id.</i> , 12:15-20)
Step Sa4	store exercise intensity-beat rate pair in memory (<i>id.</i> , 12:21-23)
Step Sa5	if there are fewer than three exercise intensity-beat rate pairs, exit the calculation display processing until the next 30 second increment, otherwise, continue (<i>id.</i> , 12:24-38)
Step Sa6	if the three or more exercise intensity-beat rate pairs do not form a straight line relationship (<i>id.</i> , Fig. 4), tell the user to stop exercising and stop processing the interrupts (steps Sa10, Sa11) (<i>id.</i> , 13:1-12), concluding the VO_{2max}/wt estimation process; otherwise, continue
Steps Sa7-Sa9	estimate and display the maximum oxygen uptake quantity (VO_{2max}/wt) from the most recent exercise intensity-beat rate pair and exit the calculation display processing until the next 30 second increment (<i>id.</i> , 12:39-67)

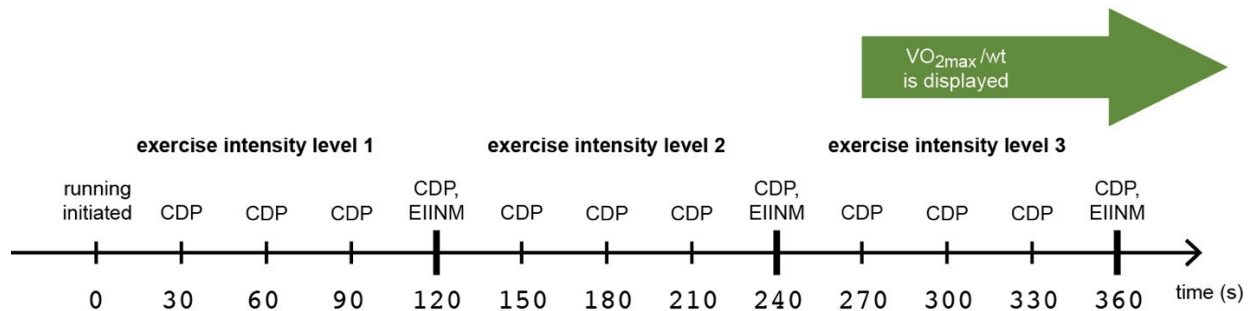
These steps are repeated every 30 seconds and are executed to calculate and display maximum oxygen uptake quantity VO_{2max}/wt . (*Id.*, 13:13-26.)

17. The steps of Amano's "**exercise intensity increase notifying means**" are:

Step Sb1	detect the pitch of the user running " calculating display processing " (same as step Sa2 and step S9) (<i>id.</i> , 13:40-43)
Step Sb2	determine the pitch at which there is a 10% increase over the pitch detected in step Sb1 and generate a corresponding alarm (<i>id.</i> , 13:43-51, 14:43-57)

These steps prompt the user to increase exercise intensity to generate three or more exercise intensity-beat rate pairs and are repeated every 120 seconds. (*Id.*, 6:59-66, 12:24-47.)

18. Amano describes an example of the system in operation in “1.3 Specific operation.” (*Id.*, 14:4-16:14.) In this example, Amano describes that the user first runs at a constant pitch for 120 seconds, and the calculation display processing executes four times during this time. VO_{2max}/wt is not yet displayed, as the exercise intensity (product of the user’s weight and pitch) is constant during this 120 second period, so only one exercise intensity-beat rate pair is obtained. (*Id.*, 14:38-51.) After 120 seconds, the exercise intensity increase notifying means sounds an alarm to increase running pitch (and therefore exercise intensity, since exercise intensity is the product of pitch, stride, and weight) by 10%. Calculation display processing is again carried out four times, and again VO_{2max}/wt is not yet displayed, as the user has now only exercised at two exercise intensities. (*Id.*, 14:52-65). After 120 seconds, exercise intensity increase notifying means again prompts the user to a 10% increase in exercise intensity. (*Id.*, 14:66-15:5.) When calculation display processing is carried out 30 seconds later, there are now three exercise intensity-beat rate pairs, and VO_{2max}/wt is displayed. (*Id.*, 15:6-18.) An example timeline is illustrated in the figure below, where “CDP” refers to “calculation display processing” and “EIINM” refers to “exercise intensity increase notifying means.” The estimation procedure continues until an exercise intensity-beat rate pair is obtained that does not fit a straight line with the other pairs.



19. Amano’s estimation protocol can function properly even if the user decides not to increase running pitch by 10% when prompted. The only requirement for the estimation of VO_{2max}/wt is that at least three exercise intensity-beat rate pairs, in a straight line relationship, are obtained. (*Id.*, 13:56-67, Fig. 4.) Additionally, Dr. Bergeron states that the passage at 13:56-67 describes the “exercise intensity” as not obtained during the steps where Amano is notifying the test subject to increase exercise by 10%. (Ex. 2008, ¶67.) However, this passage merely explains which of the two processes (“calculation display processing” or “exercise intensity increase notifying processing” (also referred to as “exercise intensity increase notifying means”)) obtains the exercise intensity. The passage at 13:56-67 does not suggest that “exercise intensity” has two different meanings.

20. Amano’s teachings describe “prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of physical fitness of a user” (limitation [1C]), under either Nike’s or my construction.

21. As described above, the exercise intensity level during each exercise period is calculated as the product of pitch, stride length (associated with height), and weight, (*id.*, 7:30-37, 12:15-21), and at least weight is an attribute “that the user has or achieves that relates to the ability to perform physical work.” (EX2009, 129.) Amano’s 10% pitch increase (prompted every 120 seconds) corresponds to a 10% exercise intensity increase, because exercise intensity is the product of pitch, stride length, and weight. (EX1002, 7:30-37, 12:15-21.) Just as each exercise intensity level is based on a level of physical fitness of a user, each increase, which is 10% of the previous exercise intensity level, is also based on a level of physical fitness of a user. (*Id.*, 13:44-50, 14:43-58.)

22. Dr. Bergeron agrees that Amano discloses calculating exercise intensities based on the weight and stride length of the individual user. (EX2001, ¶111; EX2008, ¶¶67-68.) But Dr. Bergeron argues that Amano does not teach limitation [1C] based on Nike’s construction of “wherein an exertion level is based on a level of physical fitness of a user.” (EX2008, ¶64.) Dr. Bergeron states that Amano’s protocol for estimating VO_{2max} is without regard to an individual user’s physical fitness condition. (*Id.*, ¶65.)

23. To support his position, Dr. Bergeron offers an incorrect theory that Amano provides two distinct usages of the term “exercise intensity.” (EX2008, ¶¶40-42, 67-69.) Dr. Bergeron alleges that Amano’s “column 12” describes

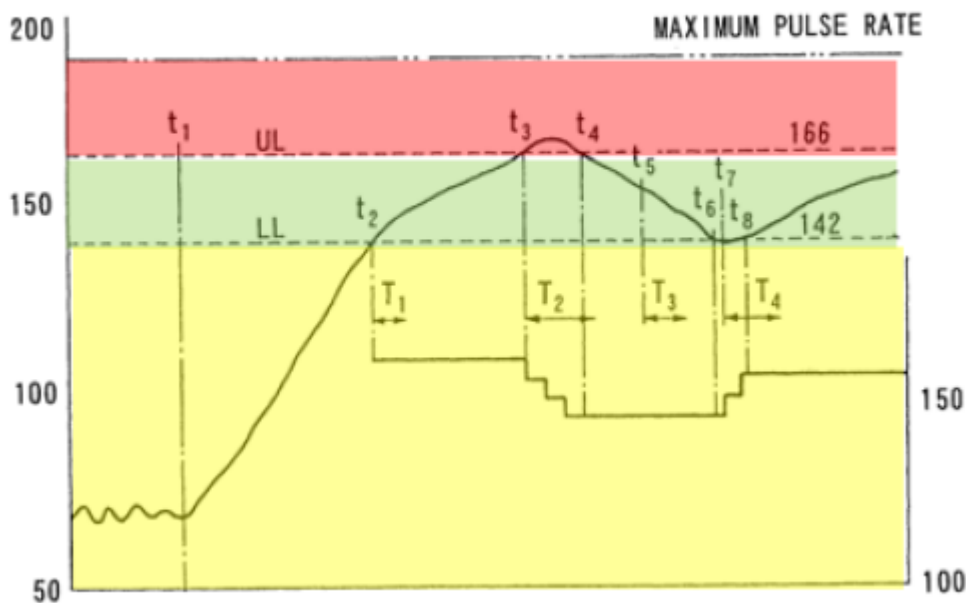
“exercise intensity” in the context of power (in Watts [W]), but that the 10% exercise intensity increase of the exercise intensity increase notifying means is different, because it refers to 10% increases in pitch. (*Id.*, ¶¶67-69.) This argument is flawed. Since Amano consistently defines exercise intensity as pitch times stride length times weight, a 10% increase in pitch equates to a 10% increase in exercise intensity. Prompting the user for a 10% increase in pitch is the same as asking for a 10% increase in exercise intensity. There is no ambiguity in the meaning of exercise intensity in Amano.

24. Dr. Bergeron argues that Amano’s 10% pitch increases are the same for all users. (EX2008, ¶¶66, 67, 69.) While the percentage is 10% for all users, the increase in pitch (expressed in steps per minute, for example) is not, because the initial pitch depends on the user. (EX1002, 12:12-14.) Amano detects the initial pitch; the first 10% increase is an increase over the detected initial pitch; and then the second 10% increase is an increase over the pitch from the first 10% increase. (*Id.*, 12:36-41, 13:44-55, 14:43-65.) The initial pitch is proportional to the initial exercise intensity, the initial exercise intensity is based on a level of physical fitness of a user, and as a result, the first and second 10% increases (and corresponding prompts) are also based on a level of physical fitness of a user. That is, Amano “takes into account an individual user’s particular physical fitness condition” (part of Nike’s construction).

B. Amano Teaches “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels” (Limitation [1D])

25. Amano determines its VO_{2max} using “three or more exercise intensity beat rate pairs,” which include first heart rate measurements received from a sensor while the user exercises at a plurality of successive exertion levels. (EX1002, 12:36-37.) Amano uses the estimated VO_{2max} to determine upper and lower limits UL and LL for heart rate (pulse rate). (*Id.*, 19:40-43, 20:19-28.) Amano determines a plurality of heart rate zones based on upper and lower heart rate limits UL and LL, as shown in Figure 27 (annotated with red, green, and yellow colors, below). (*Id.*, 20:19-28; Decision on Institution (DI) (Paper 11), 28.)

FIG. 27



26. Dr. Bergeron argues that because Amano uses a standardized pulse rate table based on VO_{2max} , the upper and lower heart rate limits UL and LL are “without regard to any heart rate measurements taken while that user exercised.” (EX2008, ¶71.) I disagree. Amano determines the heart rate zones based on VO_{2max} estimated from the “calculation display processing” process (described above), which is based on heart rate measurements received from a sensor. (EX1002, 19:49-51.) Therefore, Amano teaches “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor,” regardless of whether a table and user input “based on” VO_{2max} are consulted.

C. Amano’s First, Fourth, and Eighth Embodiments Are Not Distinct Embodiments

27. Dr. Bergeron argues that Amano’s first, fourth, and eighth embodiments are multiple, distinct embodiments. (EX2008, ¶¶70, 72.) Dr. Bergeron does not explain why these embodiments are distinct. Regardless, Amano explicitly connects the teachings of “Embodiments” 1, 4, and 8 of Amano. Amano explicitly connects its first and fourth embodiments, stating for the fourth embodiment that, “[t]he user estimates his own VO_{2max} in advance using the methods explained in the *first . . . embodiment*.” (EX1002, 19:49-50 (emphasis added); EX2012 (Lynch Sept. 27, 2023 deposition), 166:5-17.) Amano also explicitly connects its first and eighth embodiments, stating for the eighth embodiment that, “[t]he user[’]s VO_{2max} was obtained in the preceding *first . . . embodiment*.” (EX1002, 38:23-25

(emphasis added).) I note that it is irrelevant whether VO_{2max} “*could have been* calculated using [other] methods,” as Dr. Bergeron argues. (EX2008, ¶71.) Amano’s first, fourth, and eighth embodiments are not distinct.

D. Amano Teaches Dependent Claims 5 and 7

28. Dr. Bergeron does not make separate arguments for claims 5 and 7. (EX2008, ¶73.) Instead, Dr. Bergeron concludes that Amano does not teach dependent claims 5 and 7 solely on the basis that it does not disclose claim 1. (*Id.*) Because Dr. Bergeron’s arguments for claim 1 are incorrect, his arguments for dependent claims 5 and 7 also incorrect.

IV. AMANO AND GORMAN/FLACH

A. The Dependent Claims Encompass Both Wired and Wireless Communications

29. The challenged dependent claims of the ’413 patent encompass both wired and wireless communications. In other words, nothing in the language of the challenged dependent claims or the specification suggest that the dependent claims are limited to wireless. Claims 2, 13, and 18 recite limitations directed to encoded messages; claim 3 is directed to decoding; claims 3, 4, 13, and 18 relate to identification data of the sensor; claim 9 is directed to the time at which a message is received; and claims 14 and 19 are directed to a time channel for communicating with the sensor. (EX1001, 18:24-31, 18:46-49, 19:9-16, 20:17-21.) The specification discusses wired sensor interfaces at 5:30-32. And 7:16-36 describes encoding

messages, which a POSITA would understand applies to wired or wireless communications. (EX2012 (Lynch Sept. 27, 2023 deposition), 213:21-24, 214:3-6; 251:16-252:3; EX1017 (Bergeron Dec. 21, 2023 deposition), 92:23-93:19.) Other aspects, such as identification data in messages, are applied to both wired and wireless communications. (EX2012 (Lynch Sept. 27, 2023 deposition), 221:18-222:8, 223:5-16, 226:19-227:6, 241:5-16.)

30. In short, a POSITA reading the '413 claims in 2003 would have understood that the concepts of (1) encoding and decoding messages, (2) including sensor identification data in messages (*e.g.*, in the message identification portions of Controller Area Network (CAN) bus messages), and (3) providing time channels for message senders and recognizing message senders based on the time of receipt (*e.g.*, time-division multiple access (TDMA)) were known and used in both wired and wireless systems.

B. A POSITA Would Have Combined Amano and Gorman/Flach

31. Dr. Bergeron argues that there are no teachings or suggestions in Amano that its wired device suffers from the problems that Gorman and Flach claim to solve for their wireless features. (EX2008, ¶¶74, 80, 81.) Gorman teaches transmitters including sender identification data in their encoded messages, and Flach teaches a TDMA method assigning different communication timeslots to different transmitters. Dr. Bergeron specifically argues that with wired devices, there

is no need to distinguish among multiple transmitters communicating with the same receiver. (*Id.*, ¶¶76, 80.) This is not true. When there are multiple transmitters, such as sensors, sharing a wired communication bus, TDMA can be used to assign different timeslots to the transmitters, allowing the receiver to distinguish the transmitter of a message based on the time the message is received. (EX2012 (Lynch Sept. 27, 2023 deposition), 222:10-21; EX1017 (Bergeron Dec. 21, 2023 deposition), 102:1-103:2.) Wired TDMA was well known in 2003. Also, multiple transmitters on a single wired CAN bus must include message identification data in each message to (1) allow arbitration on the bus (if multiple transmitters try to send messages simultaneously, the sender with the highest-priority identification data wins control of the bus), and (2) allow receivers on the bus to know which transmitter is sending the message. (EX2012 (Lynch Sept. 27, 2023 deposition), 221:24-222:21.) Amano discloses multiple sensors on a finger belt, a pulse wave sensor and a body motion sensor, sharing a cable to a wrist watch. (EX1002, 7:6-27, 20:40-44, Figs. 16, 19.) However, Amano does not provide the details of its communication, which would motivate a POSITA to look to the prior art for details regarding concepts such as TDMA.

32. A POSITA also would have been aware of wireless components to replace the components for wired communication, since both wired and wireless communication may involve transmitters (with encoders and possibly message

identification data, TDMA, or other features) and receivers (with decoders and possibly data integrity checks, TDMA, or other features), which would combine teachings of Amano with teaching of Gorman or Flach. (EX1009, ¶¶105, 106.) Additionally, it would have been obvious to a POSITA to combine Amano and Gorman, and Amano and Flach, given that the teachings of Gorman and Flach (encoding, time slots (TDMA), and identification information) were well known to a POSITA, and have been applied to both wired and wireless devices. (EX2012 (Lynch Sept. 27, 2023 deposition), 241:5-16; EX1017 (Bergeron Dec. 21, 2023 deposition), 93:7-19, 100:11-22.)

33. And although Dr. Bergeron alleges in his declaration that wired devices do not face problems with noise, he provided the correct testimony during his deposition. (EX2008, ¶76; EX1017 (Bergeron Dec. 21, 2023 deposition), 93:7-10 (“if there’s noise on the line – on the wire . . . you’d have to have some way to . . . filter the noise out”).) Thus, wired devices, such as Amano’s, do experience problems addressed by the teachings of Gorman and Flach.

34. Dr. Bergeron also argues that there is no reasonable expectation of success in combining Amano and Gorman/Flach because the combination would require a complete redesign. (EX2008, ¶¶74, 77.) Dr. Bergeron names example components, such as a radiofrequency transmitter unit and a radiofrequency receiving unit with a display, but these components are specific to wireless devices.

(*Id.*, ¶77.) A POSITA would know that there are components that are equivalent counterparts for wired communications, such as a transmitter unit and a receiving unit. (EX1017 (Bergeron Dec. 21, 2023 deposition), 91:8-93:24.) Additionally, as described above, wired and wireless communication share many features (also true for infrared optical communication and radiofrequency wireless (EX2008, ¶78)), including the possible use of message identification data and TDMA, and components for replacing wired communication with wireless communication were well known to a POSITA. (EX2012 (Lynch Sept. 27, 2023 deposition), 218:7-9.) The overlapping teachings of Amano and Gorman, including teachings of identification data, reflect the knowledge of a POSITA. Thus, the combination would be within the knowledge of a POSITA and would not require a complete redesign.

V. MATSUMOTO

A. Matsumoto Teaches “prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of physical fitness of a user” (Limitation [1C])

35. Dr. Bergeron argues that Matsumoto does not teach limitation [1C] based on Nike’s construction of “wherein an exertion level is based on a level of physical fitness of a user.” (EX2008, ¶84.) Dr. Bergeron states that Matsumoto’s selection of workout programs is without regard to an individual user’s physical fitness condition. (*Id.*) But as discussed in paragraphs 6-13 above, “wherein an

exertion level is based on a level of physical fitness of a user” means “wherein an exertion level is adaptive to a user’s physical fitness.” Matsumoto selects the workout program using physical attributes: age, sex, and weight of the individual user. (EX1003, 3:4-64.) The use of the individual user’s physical characteristics allows Matsumoto to design a workout program that is “suited to an individual user’s physical fitness,” and thus, not one-size-fits-all. (EX1003, 4:33-35.) That is, Matsumoto “takes into account an individual user’s particular physical fitness condition.” Accordingly, under either my or Nike’s construction of “wherein an exertion level is based on a level of physical fitness of a user,” Matsumoto teaches limitation [1C].

B. Matsumoto Teaches “a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels” (Limitation [1D])

1. Matsumoto teaches a plurality of heart rate zones

36. Dr. Bergeron argues that Matsumoto does not disclose a “plurality” of heart rate zones. (EX2008, ¶88.) Dr. Bergeron acknowledges that Matsumoto discloses a “target pulse ± 5 ,” but calls this a single target pulse zone. (*Id.*, ¶89.) I disagree. The “target pulse ± 5 ” is one heart zone, but there are two other heart rate zones: one (lower) heart rate zone with heart rate values that are less than (below) the target pulse zone, and another (upper) heart rate zone with heart rate values that are greater than (above) the target pulse zone. A POSITA would understand that the

lower heart rate zone would start at the user's resting heart rate, and the upper heart rate zone would end at the user's maximum heart rate. Dr. Bergeron agreed in his deposition. (EX1017 (Bergeron Dec. 21, 2023 deposition), 103:9-106:8.) Matsumoto discloses an LED that emits colors that correspond to the three heart rate zones: "green, red or yellow light, to inform the user whether he is *above, below or within the target pulse zone (e.g. target pulse ± 5)*." (EX1003, 7:48-51 (emphasis added); *see also id.*, 9:37-40.)

2. Matsumoto teaches heart rate zones and heart rate measurements in the same embodiment

37. Dr. Bergeron also argues that Matsumoto's heart rate zones are not "based on" first heart rate measurements received from a sensor while the user exercises. (EX2008, ¶88.) I see two errors with Dr. Bergeron's arguments.

38. First, Dr. Bergeron argues that Matsumoto's heart rate zone is determined by a formula that does not use heart rate measurements taken while the user exercises. (*Id.*, ¶¶88, 90.) According to Dr. Bergeron, only a single heart rate measurement (pulse at rest) is used. (*Id.*, ¶90.) However, Dr. Bergeron is ignoring Matsumoto's "[e]xercise rating" used to determine "[t]arget pulse." (EX1003, 8:56-60.) The exercise rating is calculated using a "[p]ulse while exercising," measured from the previous workout session. (*Id.*, 6:3-11, 8:67-9:5.) As a result, the target pulse is calculated using a plurality of heart rate measurements (pulses while exercising).

39. Second, Dr. Bergeron argues that Matsumoto discloses two distinct embodiments, with Table 2 and column 5 from a first embodiment and “target pulse ± 5 ” at 7:50-51 from a second embodiment. (EX2008, ¶89.) According to Dr. Bergeron, the two embodiments are distinct because the interfaces, controllers, and circuits of the first embodiment (depicted in Figures 3-5) are completely different from the interfaces, controllers, and circuits of the second embodiment (depicted in Figures 10 and 11). (*Id.*) Dr. Bergeron argues that there is no suggestion that the two embodiments could interact in any way. (*Id.*) I disagree.

40. Matsumoto provides several disclosures between the two “embodiments” that discuss overlapping aspects and show that the concepts from columns 5-8 are connected. (EX2012 (Lynch Sept. 27, 2023 deposition), 175:22176:15.) To start, Matsumoto discloses “[t]he objective of this invention, namely, providing an exercise program that is suited to the individual user’s physical fitness, is not limited to the above embodiment. The same principles can be applied, for example, to the exercise management machine for jogging as shown in FIG. 2.” (EX1003, 4:33-38.) Matsumoto also discloses “[t]his invention solves the above mentioned problems, by displaying the appropriate exercise program (target pulse, exercise time, etc.) for the individual.” (*Id.*, 1:39-41.) Matsumoto further discloses “[b]y applying the basic principles of the invention, a suitable exercise program can be established for the individual (a different exercise program than for the training

bicycle), and respective data can be calculated and displayed as explained for the bicycle.” (*Id.*, 4:54-58.) A POSITA would understand these passages to mean that Matsumoto teaches combining aspects of its exercise program of the first and second “embodiments.”

41. Matsumoto also teaches that there are features that may be implemented generally with exercise machines, such as Figures 3-5, 10, and 11. Figures 3-5 and Figures 10, 11 show various features of exercise machines used with Matsumoto’s exercise programs. (*Id.*, 2:36-68, 7:36-8:14, Figs. 3-5, 10, 11.) And since there are interfaces and components that are the same in the figures (such as memory (ROM, RAM), a processor (CPU), timers, I/O, and external circuits), the exercise machines are not distinct, as Dr. Bergeron argues. (*Id.*, Figs. 3-5, 10, 11; EX2008, ¶89; EX2012 (Lynch Sept. 27, 2023 deposition), 180:1-24.) In other words, as I described during my deposition, these figures are representative illustrations of how a POSITA would at once envisage implementing Matsumoto’s exercise program suited to the individual user’s physical fitness. (EX2012 (Lynch Sept. 27, 2023 deposition), 174:3-5, 179:10-181:7.)

42. Additionally, Matsumoto discloses a limited number of ways for prompting the user and assessing the user’s fitness condition. (EX1003, 5:39-61, 7:48-55, Figs. 3, 10; EX2012 (Lynch Sept. 27, 2023 deposition), 178:24-179:8.) One known and common way was to use heart rate zones. (EX1017 (Bergeron Dec. 21,

2023 deposition), 137:21-138:1; EX2001, ¶¶68-69; EX2002; EX2003; EX1002; EX1004.) A POSITA would understand the benefits to prompting the user with heart rate zones, for example, because maintaining a user's heart rate while exercising within a heart rate zone may lead to safe and effective training. (EX1017 (Bergeron Dec. 21, 2023 deposition), 138:8-24.) Matsumoto describes determining the user's exercise program and heart rate targets for the next exercise session based on the user's results while exercising in the previous exercise session. (EX1003, 4:4-11.) It would have been immediately apparent to a POSITA to combine aspects of the "embodiments" together, as Matsumoto provides the connection among aspects of its exercise programs and exercise machines, and it was common to a POSITA to use heart rate zones with heart rate sensors and exercise programs.

C. Matsumoto Teaches "determin[ing] whether the second heart rate measurements are within the particular heart rate zone" (Limitation [1G])

43. Dr. Bergeron argues that the Petition relied on the same heart rate measurements in Matsumoto for both "first heart rate measurements" (limitation [1D]) and "second heart rate measurements" (limitation [1G]). (EX2008, ¶91.) However, Matsumoto's heart rate measurements from the first exercise session are "first heart rate measurements," and Matsumoto's heart rate measurements for future exercise programs are "second heart rate measurements."

D. Matsumoto Teaches Dependent Claims 5 and 7

44. Dr. Bergeron does not make separate arguments for claims 5 and 7. (*Id.*, ¶92.) Instead, Dr. Bergeron concludes that Matsumoto does not teach dependent claims 5 and 7 solely on the basis that it does not disclose claim 1. (*Id.*) Because Dr. Bergeron’s arguments for claim 1 are incorrect, his arguments for dependent claims 5 and 7 also incorrect.

VI. MATSUMOTO AND GORMAN/FLACH

45. For the Matsumoto-Gorman and Matsumoto-Flach combinations, Dr. Bergeron’s arguments are “[f]or largely the same reasons [as] discussed for the analogous combinations with Amano.” (*Id.*, ¶93.) As discussed in paragraphs 29-34 above, wired communication, like Matsumoto’s, can benefit from the teachings of Gorman and Flach, since wired and wireless share many features, and there would have been a reasonable expectation of success.

46. Matsumoto’s device includes multiple sensors (a pulse sensor 15, and rotation sensors 12 and 13 (“external circuits”)) that communicate with a controller 100 along a shared cable, as shown in Figures 5 and 11. As I discussed in paragraphs 31-33 above, wired devices, like Matsumoto’s, may face similar problems (*e.g.*, the need to distinguish among signals, noise, etc.) to wireless devices. I disagree with Dr. Bergeron’s assertions that Matsumoto’s use of wires avoids problems with multiple sensors trying to communicate to the same device. (EX2008, ¶100.)

Whether wired or wireless, signals communicated over a common communication channel need to be distinguished, as I discussed in paragraph 31 above. And it would have been obvious to a POSITA to combine Matsumoto and Gorman, and Matsumoto and Flach, given that the teachings of Gorman and Flach (encoding, time slots (TDMA), and identification information) were well known to a POSITA, and have been applied to both wired and wireless devices. (EX2012 (Lynch Sept. 27, 2023 deposition), 241:5-16; EX1017 (Bergeron Dec. 21, 2023 deposition), 93:7-19, 100:11-22; EX2008, ¶¶95, 98, 99.)

47. I also testified regarding the interfaces and components in the exercise machines of Figures 3-5, 10, and 11 of Matsumoto that are the same: memory (ROM, RAM), a processor (CPU) (controller), timers, I/O, external circuits, etc. (EX2012 (Lynch Sept. 27, 2023 deposition), 180:1-24.) Dr. Bergeron also provided testimony regarding components (such as a transmitter, communication channel (same wire for wired devices, same frequency for wireless devices), receiver, encoding components) and problems that would be the same for wired and wireless devices. (EX1017 (Bergeron Dec. 21, 2023 deposition), 89:17-20, 91:6-98:3.) Thus, the combination of Matsumoto and Gorman/Flach would not require an “entire redesign[.]” (EX2008, ¶¶96, 99.)

VII. LUBELL AND CECI

A. A POSITA Would Have Combined Lubell and Ceci

48. Lubell provides a specific, predetermined exercise test protocol for automatically calculating a fitness parameter (*e.g.*, “at least the maximal oxygen uptake VO_{2max} ,” heart rate, etc.). (EX1004, 2:45-51, 3:19-20.) Lubell’s predetermined protocol is an extremely intense one: “the subject, wearing the device, is paced to run at speeds of approximately four miles per hour for the first three minutes, and then at six miles per hour, eight miles per hour, ten miles per hour, twelve miles per hour, and fourteen miles per hour for the successive three minute intervals.” (*Id.*, 3:59-64.) The subject exercises until he or she reaches a maximal heart rate or the point of exhaustion, different from a submaximal exercise test protocol. (*Id.*, 3:45-47.) Lubell then explicitly suggests other test protocols, such as a “*submaximal* exercise test protocol . . . in *a controlled exercise environment*.” (*Id.*, 5:13-15 (emphasis added).) With a submaximal exercise test protocol, certain users (such as those that may be older or have a cardiovascular disease (CVD)) may be able to avoid dangerously reaching a point of exhaustion. (EX2010, 34 (“In many cases, [maximal] tests require maximal or near-maximal effort by the participant and thus have not been used for older persons or those at increased risk for CVD”).) Additionally, a POSITA would understand that there are other benefits to choosing a submaximal exercise test protocol over a maximal exercise test protocol including

being cheaper, quicker, and less burdensome. (*Id.* (“Any maximal test to assess cardiorespiratory fitness imposes a burden on both the participant and the examiner. To reduce this burden, several submaximal exercise testing protocols have been developed. . . . The advantage [to submaximal tests] is that large numbers of participants can be tested rapidly at low cost.”), EX1017 (Bergeron Dec. 21, 2023 deposition), 35:19-38:6.) Given that Lubell’s protocol is a maximal exercise test protocol, a POSITA would not understand the passage at 5:6-16 (EX1004) to refer only to a cycling or swimming version of its running protocol. “[C]ontrolled exercise environment” relates to a submaximal exercise test protocol. And as Dr. Bergeron agrees, Ceci teaches a submaximal exercise test protocol that may be used for cycling, swimming, or other exercises (as Lubell suggests). (EX2008, ¶111; EX1017 (Bergeron Dec. 21, 2023 deposition), 113:9-114:11.) Given the benefits to using a submaximal exercise test protocol (the details of which are not disclosed in Lubell), a POSITA would have been motivated to combine Lubell and Ceci.

49. Dr. Bergeron argues that Lubell’s main purpose is to estimate VO_{2max} . (EX2008, ¶¶107-108, 112.) However, a POSITA reading Lubell would understand that Lubell’s purpose is not to determine VO_{2max} , but instead, to “automatically calculate[] an appropriate fitness parameter” to “help[] the subject keep his exercise stress level within what is regarded as the fitness training range.” (EX1004, 2:48-49, 1:27-29; EX2012 (Lynch Sept. 27, 2023 deposition), 256:18-257:2.)

50. And although Dr. Bergeron argues that there is no explanation regarding how it is possible to use Ceci's RPE scale as a protocol for determining VO_{2max} , a POSITA would understand the relationship (compatibility) between the RPE scale and VO_{2max} , particularly in view of Ceci's disclosures and Dr. Bergeron's own evidence. (EX2008, ¶109; EX1005, 733 ("a[n] RPE range between 11 and 15 would correspond to a range of about 60-80% VO_{2max} "); EX2010, 33 (table showing relationship between RPE and VO_{2max}).) Thus, Ceci's teachings are related and usable for determining VO_{2max} , and the combination of Lubell and Ceci would result in a functional system. (EX2008, ¶¶108-109.)

51. Dr. Bergeron argues that with Ceci's protocol, there is no way to force the user to reach the maximum heart rate or point of exhaustion within the time intervals of Lubell's Van der Walt equations. (EX2008, ¶110.) However, Dr. Bergeron misunderstands the Lubell-Ceci combination, which does not use Lubell's Van der Walt equations.

1. Lubell does not teach away from using a self-regulated protocol

52. Dr. Bergeron argues that a POSITA would not have been motivated to combine Lubell and Ceci because Lubell teaches away from using a self-regulated protocol. (EX2008, ¶106.) I disagree. Dr. Bergeron cites 2:1-51 for support. (*Id.*, ¶112.) But the first passages at 2:1-25 describes a "previously-proposed fitness monitoring system . . . [that] is not universally applicable" due to the "original data

. . . [being] based only on the performance of . . . male U.S. Air Force recruits who were already in reasonably good shape.” (EX1004, 2:1-20.) “[T]his approach was not particularly useful in determining the fitness level for individuals somewhat unlike these male Air Force recruits.” (*Id.*, 2:20-25.) Thus, a POSITA would understand the first passages to be discussing prior devices that do not account for individuals of different fitness levels. The second passage at 2:26-34 discusses “previously proposed heart rate monitoring devices” that are not “program[ed to] . . . measur[e] the subject’s fitness automatically.” And the third passages at 2:35-51 describes “previously proposed fitness monitors . . . [where] there is no provision . . . to accommodate variability in stride length.” (*Id.*, 2:35-51.) None of these passages disparages or rejects self-regulated protocols.

2. A POSITA would have combined Lubell and Ceci with a reasonable expectation of success

53. Given the overlapping subject matter in Lubell and Ceci and the known methods for combining aspects of Lubell and Ceci, there would have been a reasonable expectation of success. Lubell discloses a device configured for use with either a submaximal exercise test protocol or a maximal exercise test protocol. (EX1004, 2:45-51, 3:19-21, 3:59-64, 5:6-16.) Lubell discloses the details of a maximal exercise test protocol, Ceci discloses the details of a submaximal exercise test protocol, and both are used to monitor and regulate exercise intensity. (EX1004, 1:27-29; EX1005, 737.) A POSITA would know that there are known methods for

taking heart rates and/or exercise intensity and determining VO_{2max} . (EX2012 (Lynch Sept. 27, 2023 deposition), 274:7-11.) Lubell provides one method. (EX1004, 4:39-52, 10:15-24.)

B. Lubell and Ceci Teach “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels” (Limitation [1D])

54. Dr. Bergeron argues that Lubell does not determine heart rate zones or any zones bounded by heart rates. (EX2008, ¶103.) I disagree. Lubell calculates zones of percentage VO_{2max} , such as 60-80% VO_{2max} . (EX1004, 4:39-52, 10:1-7.) Lubell discloses “continuously calculating the percentage oxygen uptake ($\%VO_{2max}$) based on the continuously measured exercise heart rate HR_E , and the stored maximal and resting heart rates HR_M and HR_R .” (*Id.*, 12:21-25.) This $\%VO_{2max}$ calculation is performed by equation (1) at 10:15-24. (*Id.*, 10:15-24.) Since there is a one-to-one mapping between $\%VO_{2max}$ and exercise heart rate HR_E , there is a one-to-one mapping between the three $\%VO_{2max}$ zones (below 60%, between 60 % and 80%, and above 80%) and the corresponding three heart rate zones. Therefore, Lubell determines a plurality of heart rate zones. Ceci also continuously measures heart rates, and does so while the user exercises at a plurality of RPE levels. (EX1005, 733.) The combination of Lubell-Ceci would continuously measure heart rates while the user exercises at a plurality of RPE levels, and then would determine a plurality of heart rate zones based on these heart rate measurements. Heart rate zones would

be bounded by heart rates corresponding to 60% VO_{2max} (“light” exertion (RPE 11)) and heart rates corresponding to 80% VO_{2max} (“hard” exertion (RPE 15)). (EX1004, 4:33-38; EX1005, 733 (“a[n] RPE range between 11 and 15 would correspond to a range of about 60-80% of VO_{2max} ”).)

55. Dr. Bergeron argues that it is not clear how Ceci’s mean heart rates across a group of 11 subjects could be used to determine a VO_{2max} range for an individual user. However, Dr. Bergeron misinterprets Ceci’s teachings. As I described in my opening declaration, a POSITA would have applied Ceci’s teachings of heart rates measured at different RPE levels to the heart rate zones in Lubell that correlate to less than 60% VO_{2max} , between 60 to 80% VO_{2max} , and greater than 80% VO_{2max} . (EX1009, ¶92.)

VIII. LUBELL-CECI AND GORMAN/FLACH

56. For the Lubell-Ceci and Gorman combination and the Lubell-Ceci and Flach combination, Dr. Bergeron’s arguments resemble the arguments he made with respect to Amano-Gorman, Amano-Flach, Matsumoto-Gorman, and Matsumoto-Flach. (EX2008, ¶¶116-121.) As I discussed in paragraphs 29-34 and 45-47 above, wired communication, like Lubell’s, benefit from the teachings of Gorman and Flach, since wired and wireless communication share many features, which were well known, and there would have been a reasonable expectation of success. (*Id.*,

¶121.) Lubell has multiple sensors (heart rate sensor 12, bicycle sensor 65) that communicate with a device 11. (EX1004, 5:48-53.)

57. Dr. Bergeron argues that Lubell's device does not use coding or encoding, but contradicted himself during his deposition. (EX2008, ¶116; EX1017 (Bergeron Dec. 21, 2023 deposition), 92:23-93:19.) Dr. Bergeron also argues that wired devices, like Lubell's, would not face the same problems (such as the need to distinguish among signals, noise, etc.) as wireless devices, like Gorman and Flach. (EX2008, ¶¶117, 119.) Dr. Bergeron further argues that there would be no motivation to combine because Lubell's device already had working components for sending a signal. (*Id.*, ¶118.) Additionally, Dr. Bergeron alleges that the combination would require a complete redesign, and TDMA is not compatible with Lubell's system. (*Id.*, ¶¶118-120.) I disagree with Dr. Bergeron's arguments for the same reasons discussed in paragraphs 29-34 and 45-47 above.

* * *

In signing this Declaration, I recognize that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case. If required, I will appear for cross-examination at the appropriate time.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code.

Dated: January 11, 2024



Dr. Kevin Lynch