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Database Systems

Fitness Application Part 1

1) Design Questions
    a. What are the implications of the participation levels in the Workout Day – Fitness Activity relationship? – **The implications are quite straight forward. EVERY Workout Day has scheduled for it 1 or more Fitness Activity. This makes sense since someone has only technically 'worked out' if they performed some type of Fitness Activity. In the other direction, SOME BUT NOT ALL Fitness Activities are scheduled by 1 or many Workout Days. This makes sense because it is possible that a user doesn't like a certain Fitness Activity, and thus, they never schedule it into their days.**
    b. Why are the Weight Machine and Free Weight Activity entity types correctly depicted as subclasses? – **They are correctly depicted as DISJOINT subclasses because a Fitness Activity cannot be simultaneously a Free Weight Activity and a Weight Machine.**
    c. In Model A, the Weight Activity entity type is both a superclass and a subclass. Why did the database modeler not make the Weight Machine and Free Weight Activity entity types of direct subclasses of Fitness Activity thereby eliminating the Weight Activity entity type? – **The database modeler for Model A uses TOTAL PARTICIPATION from the superclass 'Fitness Activity', leaving no room for any Fitness Activities that aren't the subclasses. The modeler leaves the 'Weight Activity' entity because its' subclasses have distinct functionality and attributes from Rep and Time-based exercises. By keeping 'Weight Activity', we avoid excess NULL attributes in the Rep and Time-based exercises.**

d. Model A is the most complicated, but also the most precise. What advantage does it have over Model B? What disadvantage does it have over Model B? – **Model A is more precise than Model B because of its' added subclasses and TOTAL PARTICIPATION. This classifies all types of fitness activities and avoids 'generic' Fitness Activity types that can be created in Model B with the PARTIAL PARTICIPATION from super classes to subclasses. As a result, Model A leaves less room for error, but as a result is more difficult to scale because of the TOTAL PARTICIPATION constraint. In contrast, Model B is more flexible, allowing future extensions of Fitness Activities to be much easier.**

e. In Model B, what kind of attribute is "fitness activity type"? Why does Model B require this attribute? How can Model B achieve the precision of Model A? – **'Fitness Activity Type' is a DTYPE. DTYPEs are used to distinguish between different types of Fitness Activities. We need it for Model B because we have PARTIAL PARTICIPATION from the superclass to the subclasses, thus we need the DTYPE to help identify and group different types of activities (Rep-based, Time-based, Weight). To achieve the precision of Model A, B needs to activate TOTAL PARTICIPATION from 'Fitness Activity' to its' subclasses, to prevent problems with 'generic' Fitness Activity types.**

CREATION TABLE LOGIC

'FitnessActivity', 'CREATE TABLE `FitnessActivity` (\n `FitnessActivityID` int NOT NULL AUTO_INCREMENT,\n `Name` varchar(45) NOT NULL,\n `Instructions` longtext,\n `PrimaryMuscleGroup` enum(\'Back\',\'Biceps\',\'Chest\',\'Triceps\',\'Legs\',\'Core\',\'Shoulders\',\'Multiple\',\'Cardio\') NOT NULL,\n `FitnessActivityType` enum(\'WeightMachine\',\'FreeWeightActivity\',\'RepBasedExercise\',\'TimeBasedExercise\') NOT NULL,\n PRIMARY KEY (`FitnessActivityID`)\n) ENGINE=InnoDB AUTO_INCREMENT=41 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'FreeWeightActivity', 'CREATE TABLE `FreeWeightActivity` (\n `FreeWeightActivityID` int NOT NULL AUTO_INCREMENT,\n `WeightsUsed` enum(\'Barbell\',\'Dumbbells\',\'EZ Curl Bar\') NOT NULL,\n `ImageFile` varchar(255) DEFAULT NULL,\n `FitnessActivityID_FreeWeightActivity` int DEFAULT NULL,\n PRIMARY KEY (`FreeWeightActivityID`),\n KEY `FitnessActivityID_FreeWeightActivity_idx` (`FitnessActivityID_FreeWeightActivity`),\n CONSTRAINT `FitnessActivityID_FreeWeightActivity` FOREIGN KEY (`FitnessActivityID_FreeWeightActivity`) REFERENCES `FitnessActivity` (`FitnessActivityID`)\n) ENGINE=InnoDB AUTO_INCREMENT=14 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'WeightMachine', 'CREATE TABLE `WeightMachine` (\n `WeightMachineID` int NOT NULL AUTO_INCREMENT,\n `FitnessActivityID_WeightMachine` int NOT NULL,\n PRIMARY KEY (`WeightMachineID`),\n KEY `FitnessActivityID_WeightMachine_idx` (`FitnessActivityID_WeightMachine`),\n CONSTRAINT `FitnessActivityID_WeightMachine` FOREIGN KEY (`FitnessActivityID_WeightMachine`) REFERENCES `FitnessActivity` (`FitnessActivityID`)\n) ENGINE=InnoDB AUTO_INCREMENT=16 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'WorkoutDay', 'CREATE TABLE `WorkoutDay` (\n `WorkoutDayID` int NOT NULL,\n `Name` varchar(45) NOT NULL,\n PRIMARY KEY (`WorkoutDayID`)\n) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'Scheduled', 'CREATE TABLE `Scheduled` (\n `ScheduledID` int NOT NULL AUTO_INCREMENT,\n `FitnessActivityID_Scheduled` int DEFAULT NULL,\n `WorkoutDayID_Scheduled` int NOT NULL,\n `RecommendedOrder` int NOT NULL,\n PRIMARY KEY (`ScheduledID`),\n KEY `FitnessActivityID_idx` (`FitnessActivityID_Scheduled`),\n KEY `WorkoutDayID_idx` (`WorkoutDayID_Scheduled`),\n CONSTRAINT `FitnessActivityID_Scheduled` FOREIGN KEY (`FitnessActivityID_Scheduled`) REFERENCES `FitnessActivity` (`FitnessActivityID`),\n CONSTRAINT `WorkoutDayID_Scheduled` FOREIGN KEY (`WorkoutDayID_Scheduled`) REFERENCES `WorkoutDay` (`WorkoutDayID`)\n) ENGINE=InnoDB AUTO_INCREMENT=52 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'SetAt', 'CREATE TABLE `SetAt` (\n `SetAtID` int NOT NULL AUTO_INCREMENT,\n `Value` varchar(400) NOT NULL,\n `SettingID_SetAt` int DEFAULT NULL,\n `UserID_SetAt` int DEFAULT NULL,\n PRIMARY KEY (`SetAtID`),\n KEY `SettingID_idx` (`SettingID_SetAt`),\n KEY `UserID_idx` (`UserID_SetAt`),\n CONSTRAINT `SettingID_SetAt` FOREIGN KEY (`SettingID_SetAt`) REFERENCES `Setting` (`SettingID`),\n CONSTRAINT `UserID_SetAt` FOREIGN KEY (`UserID_SetAt`) REFERENCES `User` (`UserID`)\n) ENGINE=InnoDB AUTO_INCREMENT=15 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'Setting', 'CREATE TABLE `Setting` (\n `SettingID` int NOT NULL AUTO_INCREMENT,\n `Name` varchar(45) NOT NULL,\n `WeightMachineID_Setting` int DEFAULT NULL,\n PRIMARY KEY (`SettingID`),\n KEY `WeightMachineID_idx` (`WeightMachineID_Setting`),\n CONSTRAINT `WeightMachineID_Setting` FOREIGN KEY (`WeightMachineID_Setting`) REFERENCES `WeightMachine` (`WeightMachineID`)\n) ENGINE=InnoDB AUTO_INCREMENT=15 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'User', 'CREATE TABLE `User` (\n `UserID` int NOT NULL AUTO_INCREMENT,\n `Name` varchar(45) NOT NULL,\n PRIMARY KEY (`UserID`)\n) ENGINE=InnoDB AUTO_INCREMENT=3 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'

'WorksOut', 'CREATE TABLE `WorksOut` (\n `WorksOutID` int NOT NULL AUTO_INCREMENT,\n `UserID_WorksOut` int NOT NULL,\n `WorkoutDayID_WorksOut` int DEFAULT NULL,\n `Minutes` int DEFAULT NULL,\n `Reps` int DEFAULT NULL,\n `MaxWeight` int DEFAULT NULL,\n `Skipped` tinyint DEFAULT NULL,\n `Date` date NOT NULL,\n `FitnessActivityID_WorksOut` int NOT NULL,\n PRIMARY KEY (`WorksOutID`),\n KEY `UserID_idx` (`UserID_WorksOut`),\n KEY `WorkoutDayID_idx` (`WorkoutDayID_WorksOut`),\n KEY `FitnessActivityID_idx` (`FitnessActivityID_WorksOut`),\n CONSTRAINT `FitnessActivityID_WorksOut` FOREIGN KEY (`FitnessActivityID_WorksOut`) REFERENCES `FitnessActivity` (`FitnessActivityID`),\n CONSTRAINT `UserID_WorksOut` FOREIGN KEY (`UserID_WorksOut`) REFERENCES `User` (`UserID`),\n CONSTRAINT `WorkoutDayID_WorksOut` FOREIGN KEY (`WorkoutDayID_WorksOut`) REFERENCES `WorkoutDay` (`WorkoutDayID`)\n) ENGINE=InnoDB AUTO_INCREMENT=52 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci'