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Database Management

Lab 9 – Normalization 3

### Functional Dependencies (by Table):

People:

**personID** → firstName, lastName, address, phoneNum

Coaches:

**coachID** → yearsCoached

Players:

**playerID** → teamID

AgeGroups:

**AGID** → minAge, maxAge

Teams:

**teamID** → AGID

HeadCoachRoster:

**(headCoachID, AGID)** → teamID

AsstCoachRoster:

**(asstCoachID, AGID)** → teamID

### 3NF/BCNF Justification:

This database is in third normal form, but is not in Boyce-Codd normal form. This can be seen by following the progression of normal form qualifications. Firstly, each table in this database consists solely of atomic data field entries, meaning every entry in each table has no internal substructure, making this database qualify for first normal form. Because the database is in first normal form and the non-key fields in each table rely upon only the entirety of the primary key, be it composite or singular, as

can be seen in the functional dependencies above, the database is also in second normal form. Also, because the database is in second normal form and each non-key field in the database only relies upon the primary key of its respective table, as can be seen in the functional dependency list above, the database is also in third normal form. This database is not in Boyce-Codd normal form, though, because there are issues with multiple possible candidate keys within the HeadCoachRoster and AsstCoachRoster tables. For example, in the HeadCoachRoster table, the functional dependency can be written as

**(headCoachID, AGID) → teamID**

or as

**(headCoachID, teamID) → AGID**

because the table entries can be uniquely identified by either of these composite primary keys based upon the stipulation that a team can only play in one age group. Since there do exist multiple possible candidate keys with overlapping functional dependencies, this database can be considered in third normal form, but not in Boyce-Codd normal form.

#### **SQL Create Table Queries:**

```
CREATE TABLE people (  
    personID    char(4) not null,  
    firstName   text,  
    lastName    text,  
    address     text,  
    phoneNum    text,  
    primary key(personID)  
);
```

```
CREATE TABLE coaches (  
    coachID      char(4) not null references people(personID),  
    yearsCoached integer,  
    primary key(coachID)  
);
```

```
CREATE TABLE headCoaches (  
    headCoachID char(4) not null references coaches(coachID),  
    primary key(headCoachID)  
);
```

```
CREATE TABLE asstCoaches (  
    asstCoachID char(4) not null references coaches(coachID),  
    primary key(asstCoachID)  
);
```

```
CREATE TABLE ageGroups (  
    AGID      char(4) not null,  
    minAge    integer,  
    maxAge    integer,  
    primary key(AGID)  
);
```

```
CREATE TABLE teams (  
    teamID    char(4) not null,  
    AGID      char(4) references ageGroups(AGID),  
    primary key(teamID)  
);
```

```
CREATE TABLE players (  
    playerID  char(4) not null references people(personID),  
    teamID    char(4) references teams(teamID),  
    primary key(playerID)  
);
```

```
CREATE TABLE headCoachRoster (  
    headCoachID char(4) not null references headCoaches(headCoachID),  
    AGID        char(4) not null references ageGroups(AGID),  
    teamID      char(4) not null,  
    primary key(headCoachID, AGID)  
);
```

```
CREATE TABLE asstCoachRoster (  
    asstCoachID char(4) not null references asstCoaches(asstCoachID),  
    AGID        char(4) not null references ageGroups(AGID),  
    teamID      char(4) not null,  
    primary key(asstCoachID, AGID)  
);
```

## ER Diagram:

